ARCHITECTURE

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Form in Modern Architecture

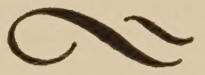
II. THE BEGINNINGS OF MODERN FORM

By Lewis Mumford

EVERY generation tends to exaggerate the extent of its own contribution to the social heritage, and to mimimize what has been done in the past. The reasons for this error are numerous: human vanity, lack of perspective, loss of memory, all have something to do with it. Modernism in architecture is the direct outgrowth of new functions, new materials, and a fresh attitude toward life: but so far from coming in with steel or concrete or bakelite, it appeared at a much earlier period, certainly as early as the time of Elizabeth.

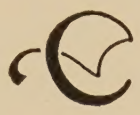
This would be a little more clear to us if we realized that the industrial revolution, which we habitually associate with the steam engine and the use of coal, actually began with the more extended use of wood: the lathe and the clock, our two capital instruments of precision, were in their primitive form built of that material. The beads and bulges on the turned legs of Jacobean tables are the finger exercises of the new industrialism; and just as there are stucco houses in England in the eighteenth century that anticipate the "feeling" of Le Corbusier or Lurçat, so there are timbered houses in the seventeenth that prophesy the form of our twentieth-century structures.

We have hitherto made the mistake of valuing our architectural past for its distance; and have prized the effect of age in gently sagging the roofline, creating texture, covering clean surfaces with moss and ivy; and we have thought of precedent as something to return to and recapture. Let us now reverse this process: let us look at the last three hundred years to see how much of the present we can find in an embryonic form. If the past be looked upon as an ancestor, the present may be tempted to copy and imitate it: but once it is regarded as an embryo, we have an incentive to further growth and development, and will not be embarrassed if the adult form of our architecture be as different from that of an older period as a grown man is from the curious little animal with gills that he becomes at one period of his existence. Another advantage: once we realize that certain battles have been fought, that certain slogans and war-cries have had their day, we shall not add to the confusion of our own times by repeating them. In short, the past is a point of departure; and without keeping this point in mind, we are likely to wander in circles.



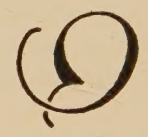
When I date the beginnings of modern architecture, not from the Crystal Palace or the Eiffel Tower, still less from the Marshall Field Warehouse or the Amsterdam Bourse, but from the Elizabethan Period, I am taking chiefly into consideration the effect of the increased production of glass during that period. The result of this was not merely to alter the relation of wall and window in the design of a building: it also changed the internal plan and fittings. Originally, the window had been a chink; the chink had become a slit; the slit had turned into a narrow window, covered by an oiled fabric which permitted a small amount of light to enter. Once glass had become a com-

mon material, and not merely an article of luxury for the well-to-do or an object of art, the whole aspect of building changed, particularly in the domestic field. The window became a ventilating mechanism, and the entrance of sunlight into the building had a beneficial effect upon cleanliness and domestic hygiene: for sunlight is a merciless critic of bad housekeeping, far worse than the most captious of mothers-in-law.



The horizontal bank of windows is a typically Elizabethan form, depending upon the use of wooden beams to carry the load in the same fashion that steel is used to-day: so that the Elizabethan framed houses are nearer to modern construction, from an engineering standpoint, than the masonry houses that were built at a later period, although the latter had the advantage of being fire-proof. Even in the stone and brick construction of the eighteenth century the window retained the importance it had acquired with respect to size: unfortunately, since these windows were vertical, not horizontal, and very high, they created a glare of overhead light: hence the curtains and hangings which were introduced to temper the harsh light and do away with the squinting that resulted. Thus one error was covered by a second error, and by the time we reach the abominably planned urban residences of New York and Philadelphia that date from the eighteen-sixties onward, we discover that curtains are used, not merely to diminish the glare but to shut out the sight of similar unpleasant barracks across the way.

In seventeenth-century design, again and again, one discovers that the window is treated as a continuous part of the wall, and not as an opening punched into it: and this treatment persisted, in certain rural parts of the United States, well into the nineteenth century. It awaited the design of the modern factory, however, before glass became the principal element in the wall. In the meanwhile, the internal functions of the building were likewise modified by the introduction of glass: because of its conductivity and because of window leakage, glass hastened improvements in heating: inventions for improving draughts in the seventeenth century, the Franklin stove in the eighteenth, and central heating in the nineteenth are, in part, responses to the more extensive use of glass, although the habit of wearing lighter clothes indoors and the growing cult of comfort no doubt played a part. Aside from this, however, the proportion of glass to insulating material depends very closely upon the efficiency of the internal heating apparatus in the winter, and upon the intensity of direct sunlight in the summer: and this again depends upon the purposes to which the rooms are to be put. This relationship is often disregarded in factory building: but it is doubtful if the uniform factory window takes sufficiently into account the difficulty of working under a summer sun between June and October; and among the obvious improvements that the extended use of glass suggests is the invention of a semi-permanent awning for use over wide wall areas, unless the equivalent shade can be obtained by judicious planting of trees. Those who think of form in relation to the engineering efficiency of the external structure rather than to the total use of a building, are frequently penny-wise in the original cost and pound-foolish in the total outlay, and what is often weak and thoughtless design has not even the excuse of being adequate engineering.



The widened use of glass has likewise had a profound effect upon the external relations of a building: and in future this effect will be even more marked. Instead of looking inward upon wall-pictures, the occupant looks outward upon window-pictures. If the outlook is blank and monotonous, he will commission a painter to do him a landscape or a bunch of flowers; but once he is dissatisfied with this substitute, once the open window makes him wish to inhale the perfumes of the landscape or hear the birds, he will plant his house in the suburbs, or, if he is very wealthy, remove it entirely to the country. The more glass one can afford to put in a building, the more important becomes its relationship with neighboring houses, and with the intervening open spaces: hence to talk of glass houses, without bringing in the correlative need for comprehensive community planning, is to ignore the most important element in the problem.

Technically, there is no end to the use of

glass with modern metal-frame construction: but without social control there is as little benefit in the openness of the glass house as there is in height of the skyscraper: for glass is not an end in itself, but a means to sunlight, pure air, and pleasant vistas: and if, for lack of intelligent community planning, these things are not secured, if the houses are badly spaced and give no privacy, if the air is polluted by motor traffic, and if instead of garden vistas there are only catwalks and garages, the boldest of technical innovations will be so much waste and lost motion.

In fact, may we not lay it down as an axiom that every collective economy, every labor-saving device, every modern material or utility tends to become a nuisance until it is collectively controlled and integrated into a new social pattern? For lack of such patterns the resources of modern technology cannot be adequately applied to modern architecture. A mass product, such as Mr. Buckminster Fuller's "Dymaxion House," thrown on the market for haphazard individual use without any equivalent invention in community planning, is capable of being as dreary a product as the yellow-brick houses of West Philadelphia and as functionally useless as an automobile on Fifth Avenue. In short, one cannot isolate the technological factor in architecture, any more than one can isolate social habits or æsthetic design; and if we are to live in glass houses we must not merely abandon the habit of throwing stones; we must abandon a great many other customs and institutions as well, including the notion that twentieth-century technology can be introduced without disruption and waste into a society that clings, with piety and reverence, to the constitutional forms of the eighteenth century and the economic shibboleths of the nineteenth.

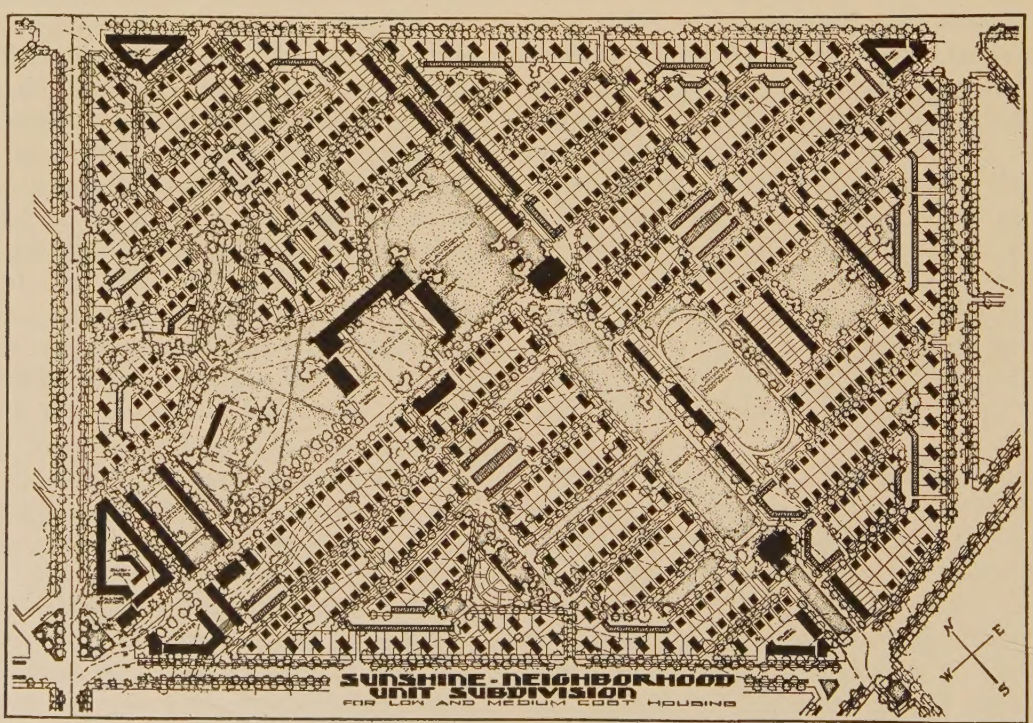
Though the window may be said, in a very literal sense, to have let the light in on modern architecture, an even more fundamental change was that which has come about through the use of iron as a structural material: for this transformed buildings from the order of crustaceans to the order of vertebrates. Like almost every other change in the industrial revolution, this was first worked out in wood before it was applied to iron: for the forefather of the modern steel-framed structure is, without doubt, the half-timbered cottage; and its successor in America, the frame house, even though the American architects of the eighties, with their various claims of priority, seem all to have overlooked this unconscious source of their form. The step from the cottage to the steel-frame skyscraper was an enormous one with respect to scale; and the change raised a hundred new technical problems, because of the architect's unfamiliarity with metal and because his scholarship was based on the pretentious stone buildings of the past, rather than upon the insignificant wooden structures of his own time: but it is no accident that the step was made and universalized in America. The interior skeleton, the wall as a protective curtain and not as a supporting member, the change from solidity to lightness and flexibility—all these qualities were present in the frame house. Even the varied silhouette of the old cottage, with its changing roof line and variously disposed masses, was prophetic of the asymmetrical designs so readily conceivable in steel.

At the beginning of the nineteenth century the air was full of hopeful prophecies about architecture; and one of these was that all the ancient building materials would be supplanted by iron: those who lived long enough saw this prophecy experimentally tested in the iron-fronted office building, in the cast-iron statues at the Centennial Exposition, and in the exposed iron trusses in certain buildings put up in the sixties and seventies, like the old Brooklyn Public Library and the original wing of the Metropolitan Museum. Now that we have escaped from the first fascination of the iron age, and no longer endow this element with magical properties, we can see that many of these hopes were misplaced. Iron, like glass, is a conductor, and it can be used safely, logically, only when it is accompanied by a fire-resistant material. From this point of view the Crystal Palace in London, which symbolized all those early hopes, and which does not lack a certain distinction, is perhaps the most completely non-functional building that any age can show—as exquisitely useless and perverse as the concealed beauties of an Egyptian tomb—for not merely

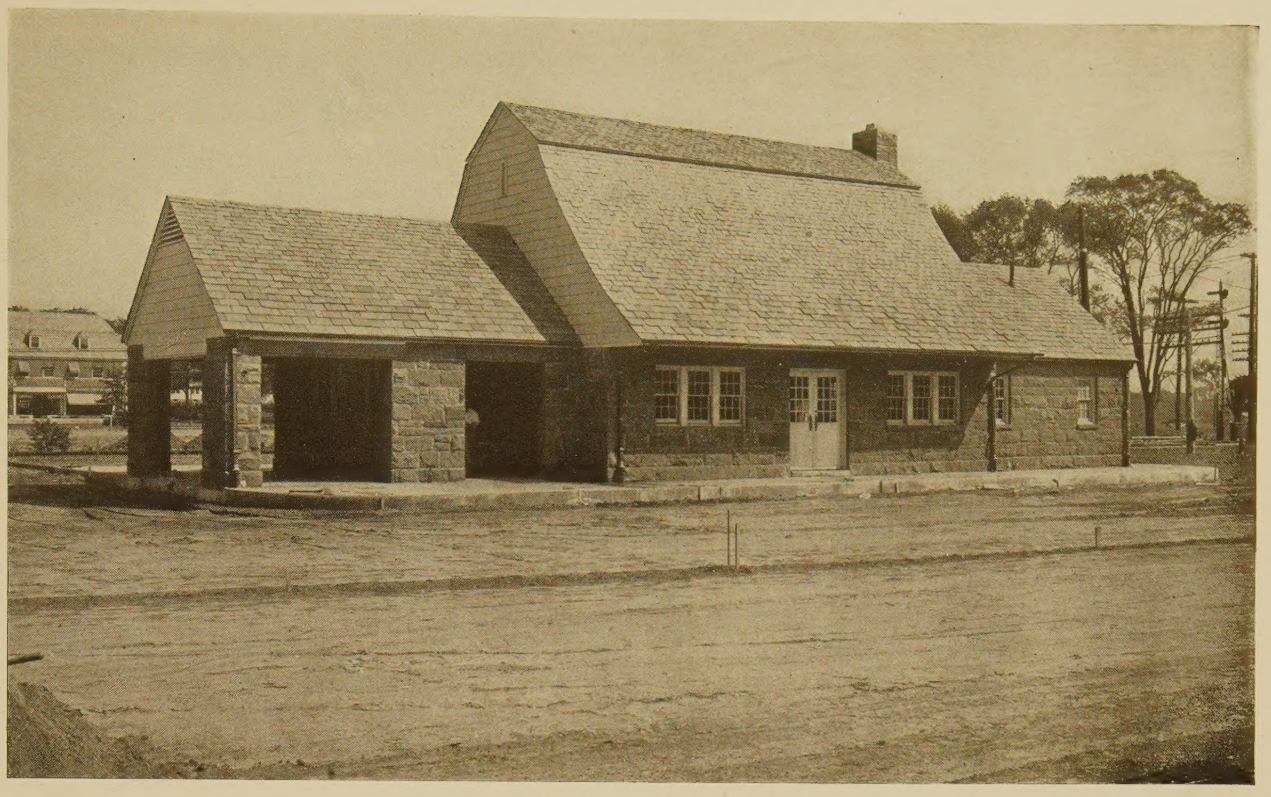
is it as liable to fire loss as a wooden building, should any inflammable material be stored in it: but also, under summer suns, it is fitter to grow early grapes than it is to receive visitors.

It is not my purpose, of course, to waste effort in flaying a dead dog: but the fact is that the Crystal Palace was legitimately hailed, in its own time, as a great forward step in architecture, as the precursor of modern form; and in its audacity and austere logic it was indeed headed in the right direction. It is, indeed, the very element of truth and imagination in its conception that makes it important for us to understand its weaknesses, weaknesses which resulted from a narrow interpretation of "function," and an exclusive preoccupation with materials which were, we can now see, prized for their magical quality, or valued as symbols, rather than rigorously appraised for their use. Substitute for the Crystal Palace the skyscraper, and the illustration becomes applicable to our own day.

Indeed, what is true of iron and glass holds equally well of every new material and mode of construction, in their principles and applications. Glass is important because we value light, because we have a physiological need of sunshine and a spiritual need for the stimulus of a pleasant outlook and of the differences in luminosity that mark the passage of the day: steel is important because it gives us an economic means of spanning space and attaining heights that were hitherto impossible, and the unbroken view in a theatre and the uncluttered space in a gymnasium aid us to function better as spectators or athletes. Where iron and glass are used, as they were used in the old-fashioned railway station, without regard to their specific functions they contribute nothing to modern form, no matter how imposing and æsthetically satisfying the forms by themselves may be. It is, then, not the technic or the material alone that gives a building modern form: what is more important is the conception behind it. While industrialism has endowed us with new sources of energy, and has contrived tools and methods that foster accuracy and precision and economy, its most important contribution to form has been in the new habits and conceptions of life for which it has supplied a basis, and in the new utilities it has added to the panoply of the modern building. The implications of this change must be left, however, for another article.



New York Regional Plan suggestion for a neighborhood unit in which every room in every house would receive abundant sunlight



Railroad station

Photographs by Richard Averill Smith

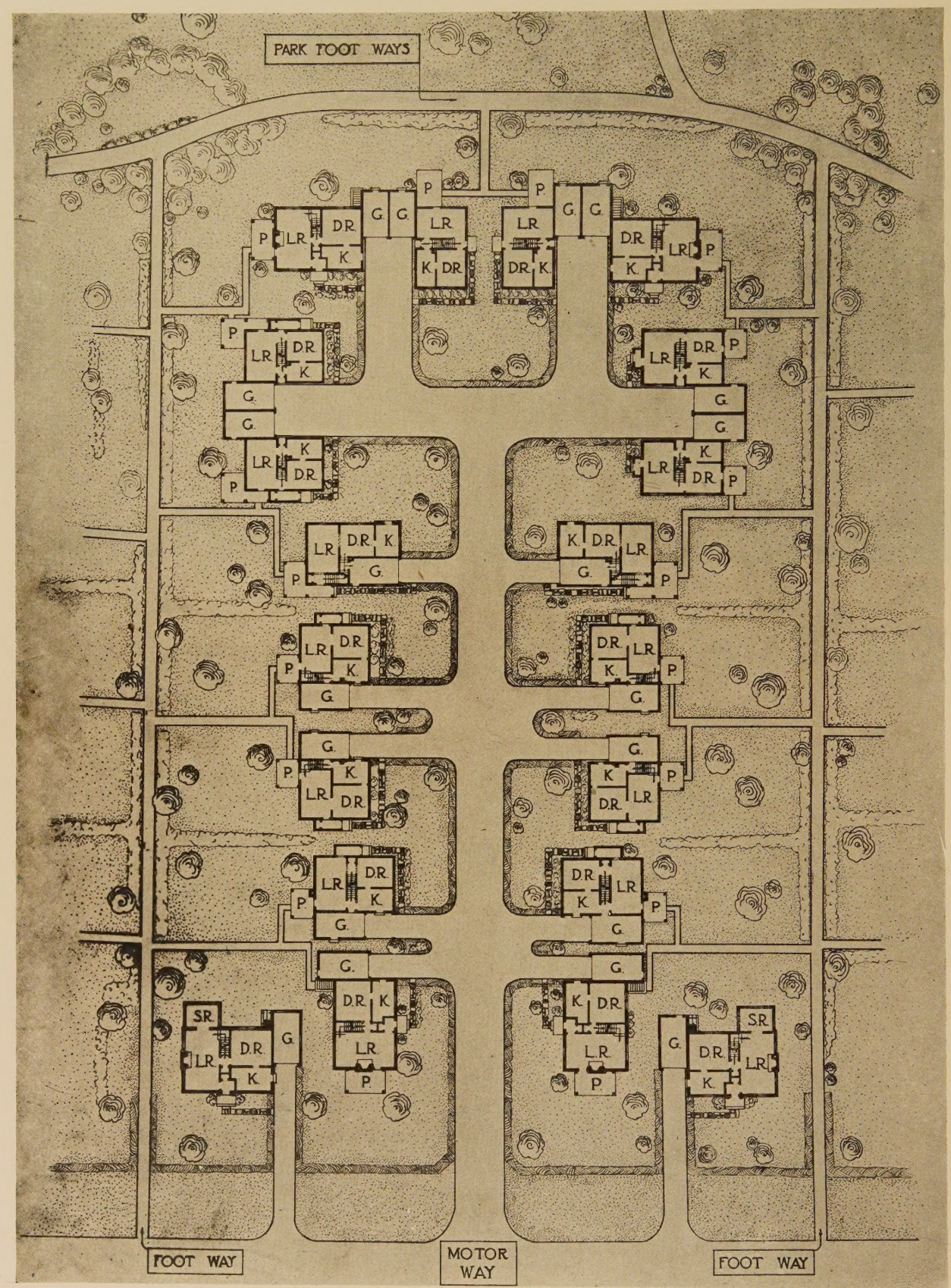
In March, 1928, we published preliminary plans of a proposed town that was designed with the motor in mind—a town in which the ever-increasing dangers and noise and odor of motor traffic could be ameliorated, or at least checked. The town is now a reality. The City Housing Corporation, a limited dividend company, is steadily carrying forward the work of construction along lines which the accompanying photographs typify. Specified outlying sections are preserved for one-family residences, and throughout there is provision for various community uses.

The architects have utilized sparingly the brown stone of the locality, such as the early Dutch settlers used. Planting material is moved out as the land is cleared and returned after the houses are completed. Twenty-six base-type plans were developed for this moderate-cost section of the town, these twenty-six being utilized, however, in about one hundred and fifty variations. Standard sizes and forms of sash, doors, dressers, etc., were adopted and manufactured in large quantities at a saving.

It is the plan itself, however, with the motor and its garage kept away from pedestrians, that is Radburn's greatest contribution to community life.

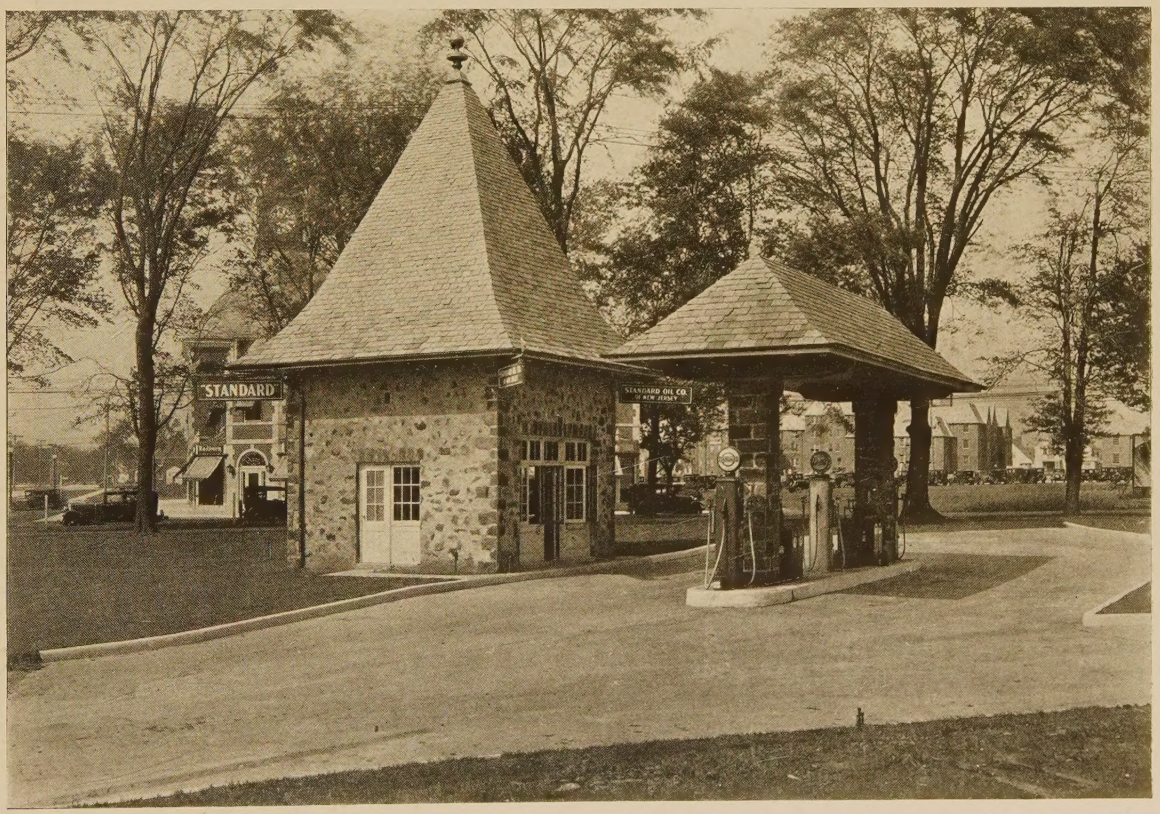
RADBURN, N. J. — A SUBURBAN TOWN PLANNED FOR THE MOTOR AGE

CLARENCE S. STEIN & HENRY WRIGHT, ARCHITECTS; ROBERT D. KOHN, CONSULTANT



One unit in the plan, the front of the houses all being approached by footpaths only, with motor way and garages at the rear

Motor traffic and pedestrian traffic are kept apart by changes of level



The gas service-station, with filling service at rear of building, is isolated from all pedestrian traffic

The appearance of a group of houses with no motor road permitted to obtrude. The semi-attached pair in the centre was awarded first prize in a recent national competition

The motor way serving the garage entrances of a typical group

For the houses themselves, in this group of moderate-cost dwellings, all of the details have been standardized, but are used in an almost infinite variety

A view from the entrance porch of one unit with no garage or motor road in sight

The shopping-centre—stores with apartments above

A pair of semi-attached houses joined only by their garages, as shown at the upper part of the unit plan

Parameters of Beauty

By Mark Barr

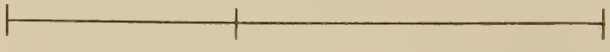
IF truth is the middle course between extremes it is very dull. Opposed camps in many fields of theory contain no truth, and in æsthetics we suffer much from needless discussion between wrong-headed enemies. The view that art is too holy a thing to bear analysis is merely silly; and the opposite view, that art is a matter of determinable formulæ, is rather worse than silly: it is dangerous nonsense.

As a lover of mathematics I wish to protest against the ignorant statements which issue from both extremes. On the one hand, the enervated æsthetic high-priest, who whispers when he speaks of art and offers the meanest jazz-school snippets on a tray of gold, tells us that mathematics is a gross exactitude of blank, uninteresting hue, and that it can in no way aid in our perception of beauty. On the other hand, there is that irritating person whom I shall call the superficial Accuratician. He loves the two-foot rule and he has a fund of natty little formulæ which, he says, are efficient guides in the pursuit of æsthetic perfection. He tells us that mathematical analysis reveals the secrets of art forms. It does nothing of the kind. There is no such mathematical analysis. There is a mass of rather indifferent school geometry put together by enthusiasts who hardly know the elements of mathematics, but even the most plausible examples can be shown to be fallacious. And in regard to those extremists of the opposite school who dislike mathematics without knowing the subject, it would be well for them and the world if they took a twenty-year course in the exquisite geometry of Einstein. They would not find the sort of exactitude they imagine; they would not find hateful data relating to the fine arts; but they would fit themselves better for the true Athenian theory of perception, which was not so bad.

The search for exact factors, or parameters, of permanent beauty is age old. Many ideal numerical proportions have been announced, but it is usual to discover that fixed rules for the forms of art had their origin in religious or other obsession. Let us examine the most persistent of these.

Doctor Piazzi Smythe, in the '50s, measured the pyramids and announced the discovery of certain ratios very much in the style of Mr. Jay Hambidge. It is rather a good joke that poor Smythe overlooked the only mathematical ratio that deeply concerned the builders, but we will explain this later. When Smythe found an approximate agreement with some favorite rule of his, he announced it as conclusive evidence; but he neglected to publish the more numerous cases of disagreement. This is true of the rules given by Hambidge and others. For example, we are told that Greek vases were made to fit in with a certain rule and we are shown only the vases which come approximately within it. The majority of vases do not follow the rule, and even if they did, what evidence have we that the rule was of æsthetic origin? As to these vases, they were quite the worst things the Greeks made. Keats wrote his ode to the figures on the urn, not to its ugly form.

There are many tenets, but the most famous is the Golden Section, usually attributed to the Greeks. In Mediæval times the formula of the Golden Section was called the *Divina Proportione*. It was stated as follows: "*The most beautiful division of a length into two contiguous parts is such that the lesser is to the greater as the greater is to the whole length.*" There is only one division which gives this relation, to



wit: Whole length of line, 1; divided into lengths .382 and .618. Here we find that the lesser is to the greater as 1 is to 1.618, and that the greater is to the whole length as 1 is to 1.618. Thus, the number 1.618 (taking three decimal places only) is the key of the Golden Section. I have proposed the symbol ϕ for it when it is traced through its mathematical relations.

The Golden Section, or *Divina Proportione*, was known in ancient Greece: to Pythagoras of Samos, who was born about 582 B. C., and to Eudoxus of Cnidus, who lived about two centuries later. Eudoxus worked out several theorems in regard to the Golden Section and they say that Euclid borrowed one of them. Pythagoras, who was supposed to be the reincarnation of Hermes' son, was said to have the inherited memory of many ancient mysteries. But he had

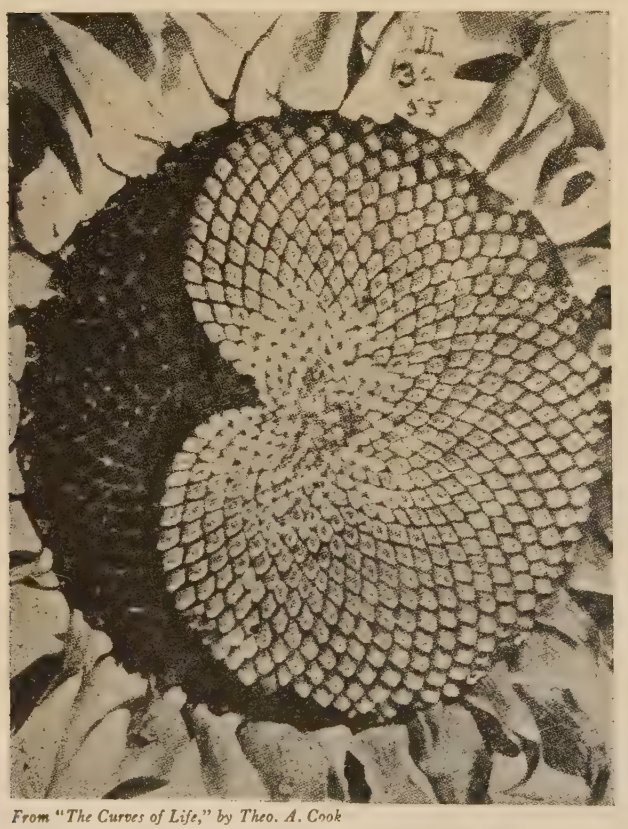
been to Egypt—a point to be remembered in connection with what follows later.

It is doubtful if Pheidias was born before the death of Pythagoras, but we do not lack commentators of an ingenious turn of mind who claim that this greatest of sculptors used the Golden Section. I doubt it.

I need not give the names of many who bear witness to the ancient, mediæval and modern users of the Golden Section as a divine proportion. I have seen many selected measurements of Greek works of art which do follow the *Divina Proportione*.

The first four terms of the Phi Series

But the usual expositors of the proportion do not mention its most important and most interesting relation. We find that the single case of line-division in the proportion of 1 to 1.618 was but the start of a running series of divisions as seen sometimes in the increasing widths between salient features from the top to the bottom of architectural structures and in other measured works of art.



From "*The Curves of Life*," by Theo. A. Cook

The sunflower, fruits partially removed, showing nature's economy of seed packing, using logarithmic curves

Thus, the widths show the following series of increasing magnitudes:

$\phi^0 = 1$
$\phi^1 = 1.618$
$\phi^2 = 2.618$
$\phi^3 = 4.236$
$\phi^4 = 6.854$
$\phi^5 = 11.090$
$\phi^6 = 17.944$

and so on. And you will find that the ratio of any term to the term below it is as 1 to 1.618.

We must not here embark upon mathematics, but it is very important to examine the relations of these magnitudes. The numbers are the successive *powers* of the number 1.618, obtained by successive multiplications by 1.618; and also it is to be observed that any term is equal to the *sum* of the two preceding terms. There is no other number having these properties, and many authors have written with conviction of its æsthetic value. Pacioli, in 1509, felt sure that the proportion was of divine origin, and Bochenek in 1885 broadly applied the ratio to works of art. Matthias followed in 1886. Leonardo da Vinci is said to have believed in it, and certainly Christopher Wren and the Adam brothers in London used it. Faith in the *Divina Proportione* has never died, and we find Professor Zeising declaring that people who had not previously heard of the ratio instinctively chose, as most beautiful, the *rectangle* so proportioned.

Mr. William A. Price and I repeated Zeising's experiments and came to a different conclusion. I think the context in which we are to use an element is of more governing force than a detail of it.

But faith was strong in many. Sir Theodore Cook, who wrote a book upon such things, had begun to see the magic ϕ in everything! He went very very far with it and even saw its use in paintings by Botticelli. And Professor Ross at Harvard traces it, with other geometrical ratios, in the work of many old masters.

I now come to a discovery which throws new light upon the subject. I had always doubted the divine origin of the ratio. I mean by this that I did not believe the Greeks to have found in the particular ratio 1.618 a constant parameter of specific beauty. It had more of an Egyptian flavor, for the builders of the pyramids and

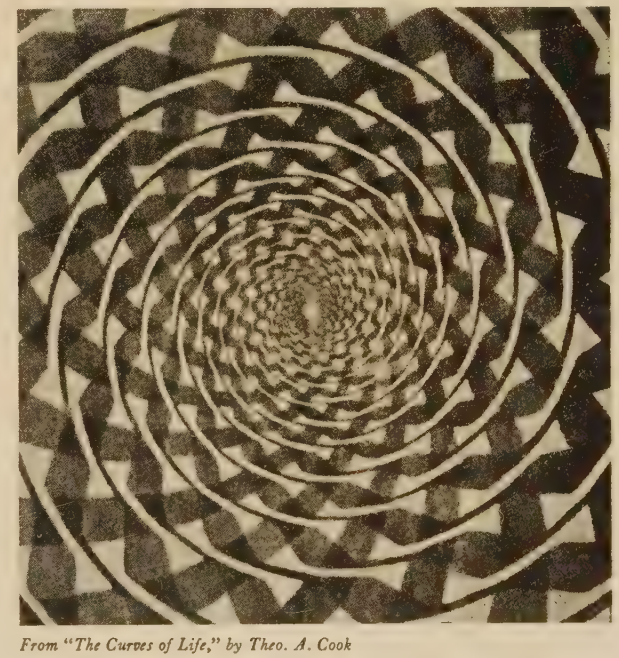
the sculptors of *Ka* portrait-statues held to many tenets vaguely founded upon obsession. Of course, the Greeks held a number of superstitious views (Pythagoras was really *too* obsessed), but the Athenians tended to make themselves at home in the world and to develop views tolerant beyond those of Egypt.

The rectangle of the Golden Section

Now, throughout the Middle Ages a different subject, in no way connected with æsthetics, was followed with interest; it will become connected with our studies in an interesting way. The great mathematician of mediæval times, Leonardo Pisano, familiarly known as Fibonacci or the Little Buffalo, had travelled in Sicily, Greece, Syria, and Egypt. He brought back from his wanderings in the East the important parts of algebra. His works, in Latin, may be found at the New York Library, and they exhibit an astonishing erudition. His first work, *Liber Abaci,* was published in 1202. Fibonacci leaves the impression that he had a dapper style as a critic, perhaps annoying to a few of his friends, who were expert in lines different from his own. I fear to quote apocryphal gossip, but there is an interesting story of Fibonacci in connection with one special subject which he is said to have originated, quite apart from what he picked up in the East. He gave to the mediæval world a series of increasing numbers which were supposed to express the law of nature governing the growth of plants. The Fibonacci Series, from unity, ran as follows:

1
2
3
5
8
13
21

and so on, each term being the sum of the two previous terms. Unlike the series of the Golden Section, now called the Phi Series, the ratio in the Fibonacci of any term to the term below it is not fixed. But if you continue the Fibonacci series to a great length and work out the ratios (simply dividing each number by the one above it) you will find that the ratio, as you proceed, rapidly approaches 1.618,—the number of the Golden Section! But this is not all. In place of Fibonacci's 1 and 2, *any* two numbers may be used as a start, and by adding these together to obtain the third term; and by adding the second and third to get the fourth and so on, we get a series having the same quality, *i.e.:* with a ratio that approaches 1.618 with great rapidity. And of them all, the Phi Series alone exhibits the exact golden ratio throughout. In other words, the Fibonacci is a rougher Golden Series. But there was no early claim of æsthetic excellence made for the Fibonacci series and its class. Flowers and plants were said to exhibit the ϕ ratio in their leaf arrangement and in other ways, and here was the hint of the origin of the Golden Section—a tenet built up from an observation of Nature. As I have said, I could not believe that the Greeks had originated the ideal Phi Series from sheer æsthetic consideration, but I had no evidence. Here, however, in the Fibonacci Series, which, no doubt, the Little Buffalo picked up in Egypt, we find a rough hint of the Golden Section and see that its origin was not æsthetic in any sense.



From "The Curves of Life," by Theo. A. Cook

The "Unit of Direction" illusion, discovered by Dr. James Fraser. A series of perfect concentric circles composed of black and white cord have been placed one within the other; owing to the checkered background, they appear in the form of a spiral

Its origin in Nature can be seen in many interesting and charming examples. Take any mature and undistorted sunflower and note the beautiful cleverness of the seed packing. In no other way could the seeds be placed with such economy of space, such uniformity of packing. Curved lines radiating in spokes from the centre, a number of them curved to the left, crossed by another number of them curved to the right. And how many? And what curves? They are logarithmic and the ratio of the number of curved boundary lines going round clockwise on the disc to the number of those going counter clockwise is 1.618, ϕ, the *Divina Proportione!* Fibonacci? Indeed, yes.

And we find that the ratio, which is approached in all the Fibonacci Series and perfect only in the ideal ϕ Series, is the ratio approached in very many plant and animal relationships. The widths of the widening spiral hallway of the snail, and other spiral shells, show the Phi Series. And there are others. A work by Professor Church of Oxford, "Phyllotaxis," gives numerous examples connected with the leaves of plants, and the writer finds that a law of probability worked out in connection with the economy of illumination upon plants leads again to the ratio 1.618.

Does not all this suggest that when the ratio ϕ was found in Nature, men of early times took it as a universal tenet—as a permanent factor of rightness? And if a factor of rightness, should it not be a permanent factor of beauty? I would agree if the context were kept in order; but for the life of me I cannot see why the charming secret of the sunflower and of the snail should give me the gauge for the most beautiful size of Greek metope or the best ratio for a window-pane. Yet we find Sir Christopher Wren measuring off 1 to 1.618 for his rectangles. And Sir Edwin Lutyens smiled when I asked him if he had *unconsciously* adopted this ratio for the increasing depth of salient widths in his Cenotaph in Whitehall and in his splendid Art Gallery at Johannesberg.

I could not believe in the supposed Greek origin of ϕ, and the vague story of Fibonacci gave me courage to declare against Pacioli, Jay Hambidge and others. And then W. A. Price, who agreed with me, made a discovery at the British Museum in the papyrus of Ahmes.

Ahmes, centuries before the golden age of Athens, had copied a still more ancient account of methods used in the Great Pyramid of Gizeh and in the pyramid of Snefeni at Medum, built in 4700 B. C. and 4750 B. C. In the ancient papyrus occur the words: "The sacred quotient Seqt was used in the proportions of our pyramids." What quotient was this? We did not know, but, taking the accurate measurements of the above pyramids made by General Howard Vyse, we found that the ratio of the slant length to the distance of ground centre from base line was our old friend 1.618! Here, then, was ϕ in ancient Egypt, and I think I have fairly established my point.

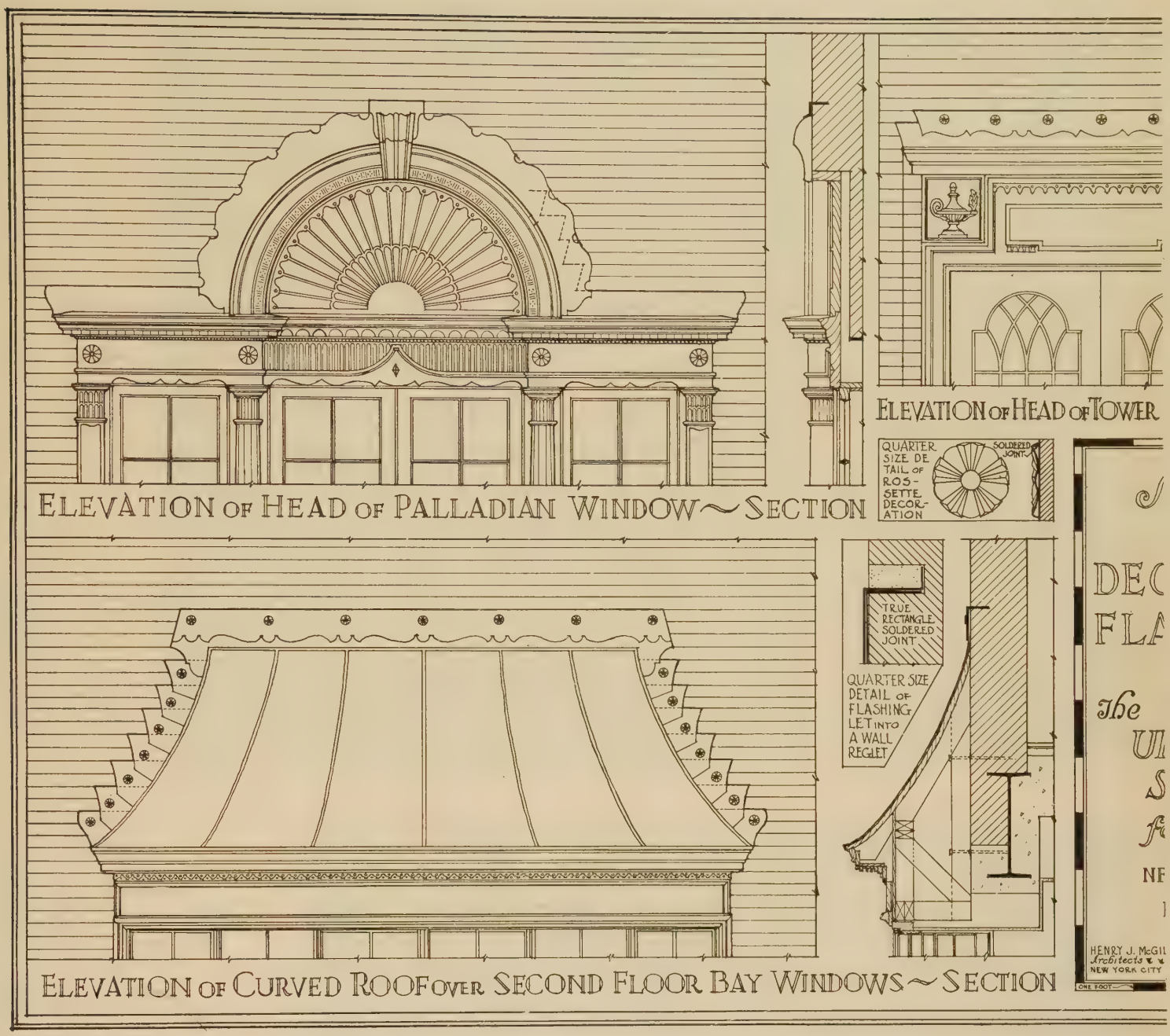
It is a pleasant faith if we hold to Nature as Wordsworth bids us:

> 'To the solid ground
> Of Nature trusts the mind. . . .'

But *context* must be regarded; we are not justified in applying one law to all domains. It is a dangerous self-indulgence to see rose-red and go æsthetically Berserk. It leads to the cult of the unintelligible. (See Max Eastman's article in the April *Harper's.*) Enthusiasts, overwhelmed with the multiplicity of stirring truth, and with their vain eyes set upon sheer originality, too often pile up unrelation, and offer it to us as æsthetic triumph. Too often do they attain the result at which an ape would arrive were he to regroup the contents of a laundry basket. Illiterate un-relation is not the proper reply to mathematical obsession.

There is one other aspect to examine. Action and reaction swing the pendulum of taste, and man turns from his brother's choice of yesterday. He declares new faith, only to be himself controverted. When we have had a surfeit of measurement—a plethora of law and too much geometry—we find many of our lovers of art saying that beauty lies in delicate imperfection. They will tell you that a gate-leg table fashioned by hand is more beautiful than one made by an accurate machine. They are entirely right. But they are mistaken in calling the hand-deviation an imperfection. The lack of geometrical exactitude gives, I think, the divine hand-writing of *skill.* It informs us, in the free Giotto circle, of the beauty of ideal effort.

Are we to say that the rose, with petals awry, is lovely solely by its apparent disregard of geometric form? Is it not better to say that the beauty lies not in imperfection but in its desirous approach to the law? Up toward the law, not down from it.



Flashing as
tunity in

By Henry J. M

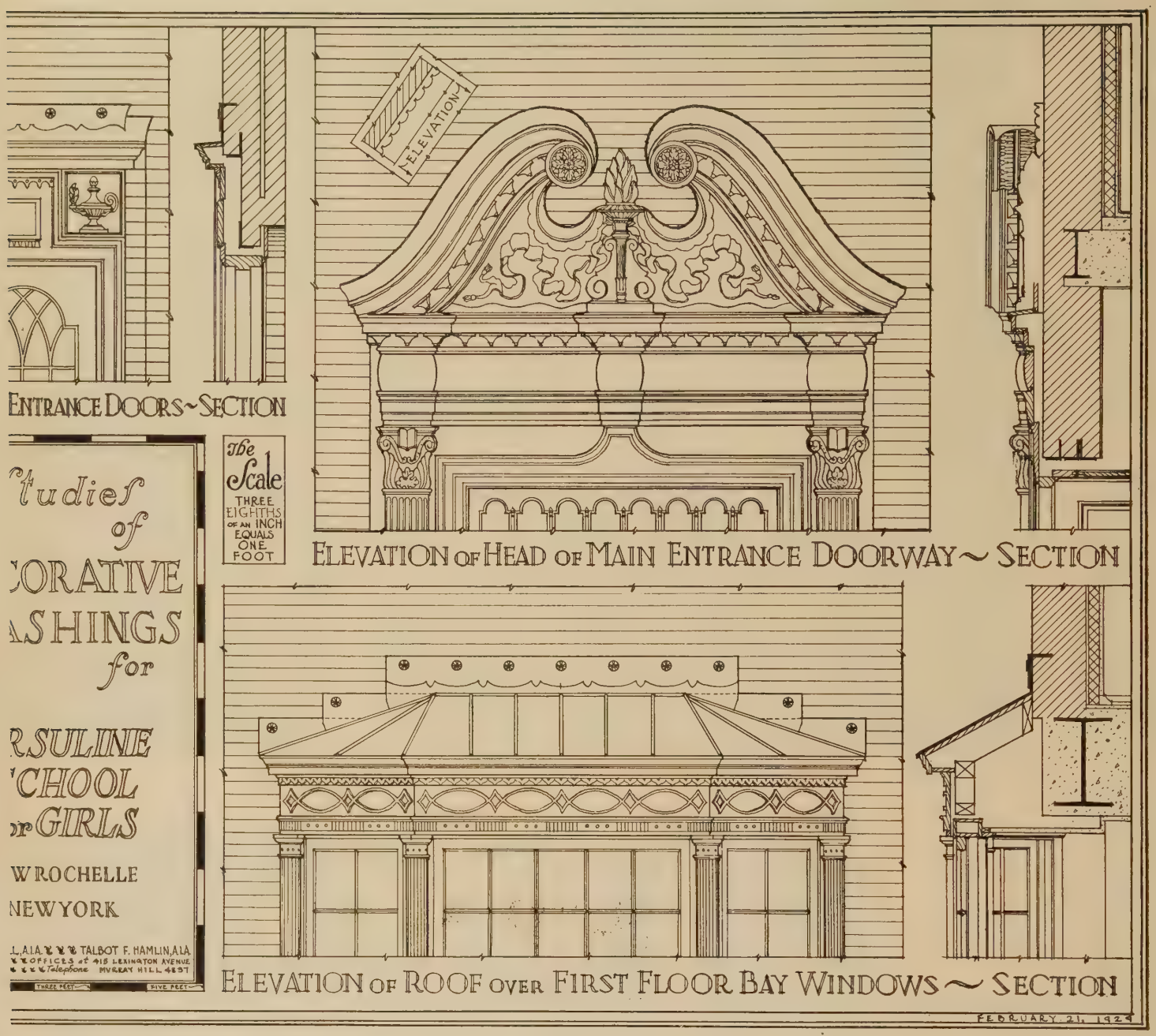
FLASHING helps a building to fulfill its primary function of keeping out the elements. It is to an architect not an altogether uninteresting subject with its manifold uses. The more an architect knows, the more liberally he uses the most enduring kind in places where its use is not always suspected.

This humble little sister among building materials has never failed us, but never have the possibilities of its being beautiful (as well as useful) dawned upon us. Even the English, who have so splendidly for centuries made ornamental the purely utilitarian features—like water conductors, cisterns, etc.—failed to recognize this modest but faithful and serviceable little agent, so always it has been neglected. At last, however, the Fairy Godmother has trans-

formed her and the Blue
the crystal slipper, and t
story.

Those little geniuses,
in and prevent midnight
cloak, from approaching.

Two principles have
professional life; one w
virtue make" and anot
thing novel and original
Only recently did I rec



an Oppor-
Design

cGill, A. I. A.

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the architects, can step
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strongly motivated my
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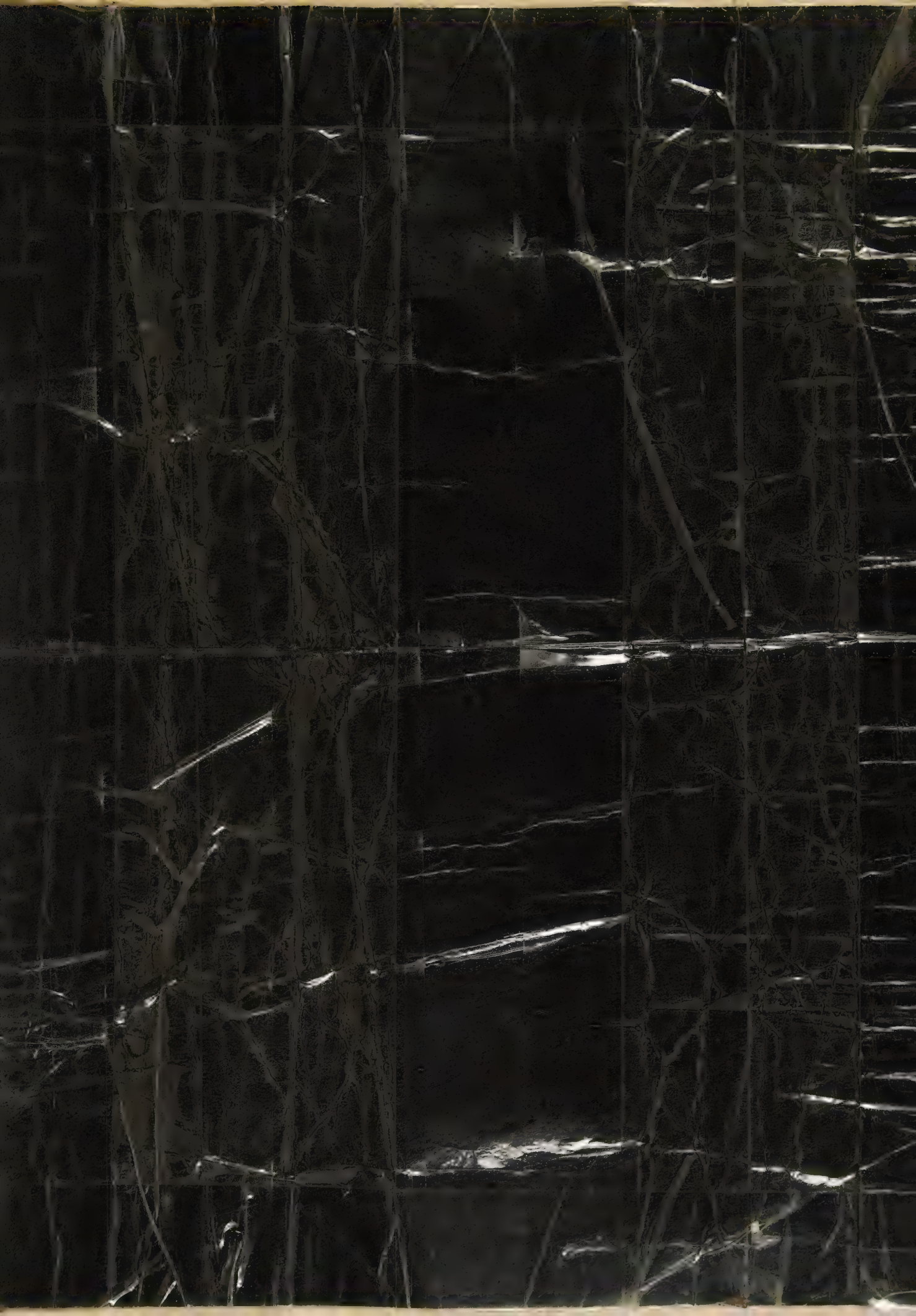
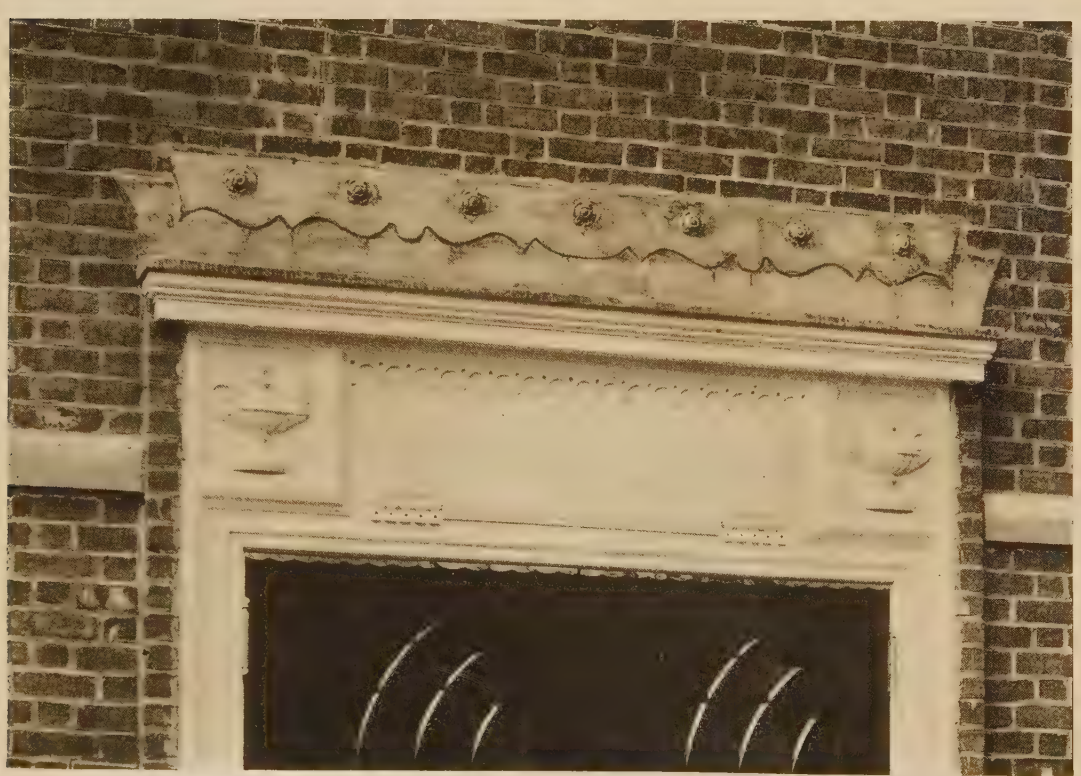
ner "contribute some-
to every undertaking."
ognize that instead of

suffering and tolerating the lowly and utilitarian flashing, it would be possible, in a simple and inexpensive manner, not only to make it becoming and tasteful in itself, but add immeasurably to the features of which it happens to be a part. It can be strongly imbued with the character of the period or motif it attends, even though originally the flashing was not so tenderly related.

For the very first time, in the Ursuline School for Girls at New Rochelle, now under construction, I am putting this theory into practice; others, I hope, will seize upon the idea and, instead of regretting, be glad the flashing is there, capable of numerous adaptations by the fertile mind. Thought and care are the chief requisites to revolutionize the use of this indispensable element.



See other side of sheet for scale drawings



HENRY J.
McGILL &
TALBOT F.
HAMLIN,
ARCHITECTS

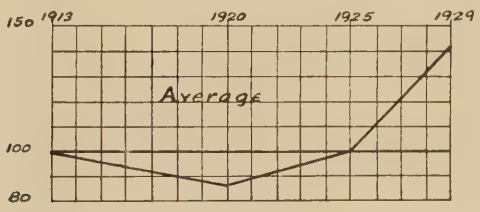
EDITORIAL COMMENT

VOL. LX, No. 6 ARCHITECTURE DECEMBER, 1929

THE FIVE-DAY WEEK

ON August last the building trades in New York City started working on a five-day week—five days for the wages paid formerly for five and one-half days, or a ten per cent increase. It is as yet too early to know just what the results are going to be with respect to the cost of building. While many students of the problem feel that greater efficiency will follow the abandonment of the rather slack half-day, others point to the fact that overhead costs, which must be based on the elapsed time of the operation, will be increased by more than a greater daily efficiency will save.

H. H. Fox, vice-president of the Turner Construction Company, has made an unusually careful study of labor efficiency during the last fifteen years and shows graphically the startling rise in man-hour production during the last four years. Mr. Fox ascribes the development



Man-hour production, 1912–1929

to three major factors: 1—improvement in management and construction plant; 2—reduced rate of expansion in building construction; 3—the attitude of the workman. His first and third points are readily accepted, but the second is less easily understood. He explains it thus: "1912 and 1913 were fairly prosperous years and the volume of building construction was normal. In 1914 the war caused a sharp curtailment. From 1915 to 1919 a large amount of construction was done for the Government, but comparatively little for private account. The result was a shortage of floor space after the war; and during 1919 a programme of expansion was initiated in order to restore the deficiency. It was an unfortunate time for it, as construction firms were disorganized and many workmen were still in the army. The inferior workmen, the camp-followers of the labor army, had to be hired and kept on the payroll. The demand for buildings was too great for the builders and their men to handle properly, and unit production decreased, as clearly shown on the charts.

"After the depression of 1921 the volume of building increased with great rapidity. In 1924 the shortage of bricklayers and plasterers in New York City was so great that bonuses were paid to the workmen in these trades. But demand in time creates its own supply, and in 1925 a balance had been restored so that man-hour production had recovered to the pre-war normal.

"Building is still going on in large volume, but for the past year the volume has not increased. It is now possible to eliminate the poorer workmen and employ only the better ones. As a result, the unit production in reinforced concrete work is the highest in history."

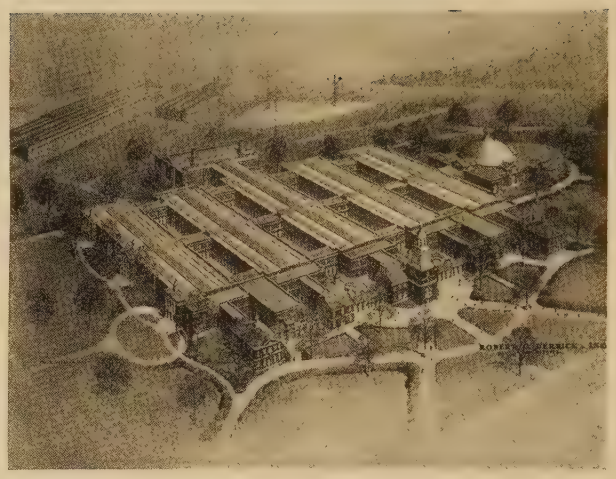
Fortunately, there are other factors in the equation by which we shall endeavor to prevent an adverse effect on either the volume or the cost of building construction. The planning and management of work is susceptible of great improvement, as is shown by the efficiency being developed in some of the larger building organizations. Greater economy of materials through more skilled design is a factor with which much still remains to be done; and with this must go a far better means of keeping our building codes abreast with this forward movement. At present these codes are lagging behind, with the effect of increasing the cost of building unnecessarily and also of discouraging ingenuity and invention in the production of more economical methods and materials.

"The harder we crowd business for time," said Henry Ford several years ago, "the more efficient it becomes. The more leisure well-paid workmen get, the greater become their wants. The industry of this country could not long exist if factories generally went back to the ten-hour day, because the people would not have time to consume the goods produced."

Beauty is a greater force in human affairs than steam or electricity, than economics or engineering.

ERNEST ELMO CALKINS

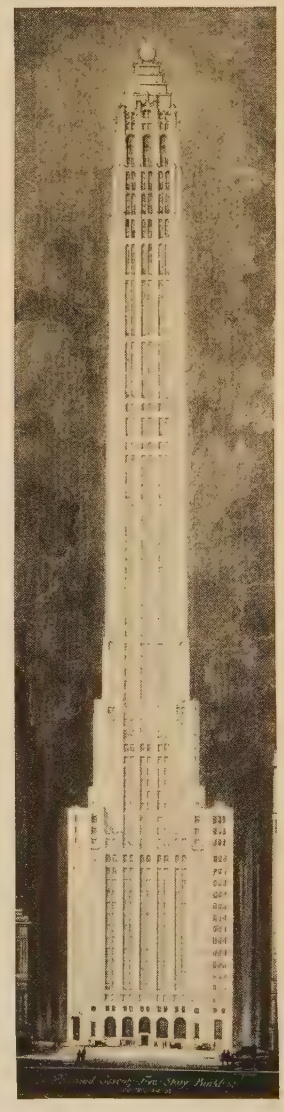
The proposed Lawrence Farms, a suburb of New York in Westchester County. Penrose V. Stout, architect; Thomas Adams, advisory consultant



Henry Ford's Museum for Americana, to teach American history visually, incorporating Independence Hall. Robert O. Derrick, Inc., architects

Architectural News in Photographs

The proposed seventy-five story building for lower Manhattan—City Bank Farmers Trust Building. Cross & Cross, architects



The projected Los Angeles Stock Exchange. Samuel E. Lunden, architect; J. and D. B. Parkinson, consulting architects

A proposed forty-story apartment-house to be erected near the Battery, Manhattan. The drawing is copyrighted by Thompson & Churchill, architects

Joseph Urban's design for The New School for Social Research, West 12th Street, New York City

The new home of the Institute of Law, Johns Hopkins University, Baltimore. Office of John Russell Pope, architect

The Metropolitan Museum has just acquired by gift this elaborate model, by Hans Schlieff, of Nuremberg as it appeared in 1625

The new Stewart Building, 56th Street and Fifth Avenue, New York City. Warren & Wetmore, architects

The Sixth Street Bridge, Pittsburgh, awarded a prize as the most beautiful bridge completed during 1928. V. R. Covell, engineer

Thomas Hastings, F. A. I. A.: 1860-1929

An appreciation by Everett V. Meeks

A LEADING personality in the world of art, Thomas Hastings attained pre-eminence and held it longer than is the lot of most men. The series of great buildings which bear his name are known to his contemporaries at home and abroad. Two of his early works still stand forth as epoch-making, the Ponce de Leon Hotel at St. Augustine, Florida, which immediately set a new standard in American architecture, and the Blair Building on Broad Street, New York, which marked the first step in the development of logical design for tall buildings. His most recent work was the redesigning of the Senate Chamber in the Capitol at Washington, and at the time of his death he was occupied on the architectural design of a new bridge to span the East and Harlem Rivers.

Although Thomas Hastings has passed on, the rare charm of his personality lives in the hearts of a host of friends in whom, through a peculiar human quality inherent in a vivacious and ever youthful disposition, he inspired real and wide-spread affection. He loved people and people loved him. Socially and artistically the world loses in his passing, but the spiritual qualities so plainly characteristic will keep his memory intimately alive long after most of his contemporaries are forgotten.

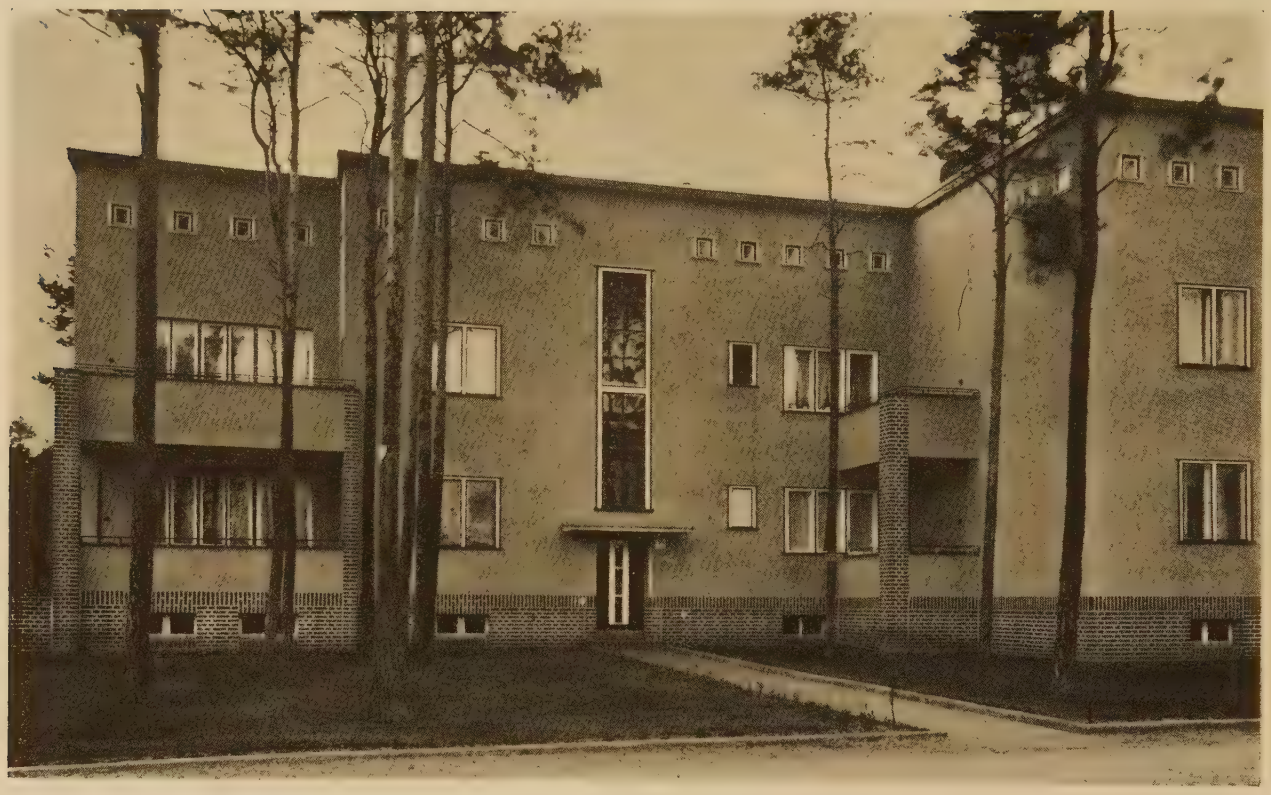
He carried this precious active quality into his work. He believed that no matter how great the demands on an architect's time might become he should always draw and design every day and most of the day, and he lived up to this precept. His work, therefore, bore the unmistakable imprint of his individuality and had much of the humanness so characteristic of the designer.

He was fond of reading and even in these crowded modern days, amid the insistent social demands naturally made upon a man of his high reputation and great charm, he kept abreast of the best of contemporary thought. Interested in people, he was naturally interested in human affairs. These interests were wide-spread. He never lost touch with the Old World and the Old World delighted to honor him. Chevalier of the Legion of Honor, member of the Institute of France, Fellow of the Royal Institute of British Architects, and Royal Gold Medallist in England, the two European countries he knew so well placed him high on their rolls of honor. In America every distinction that can come to an artist was his.

A Pictorial Review of Modern Architecture in Europe

By F. R. YERBURY, Hon. A. R. I. B. A.

Housing, Berlin-Britz, Germany—horseshoe plan surrounding small lake.
Bruno Taut and Martin Wagner, Architects



Housing, Berlin-Zehlendorf, Germany. Bruno Taut, Architect

Housing, Berlin-Zehlendorf, Germany. Bruno Taut, Architect

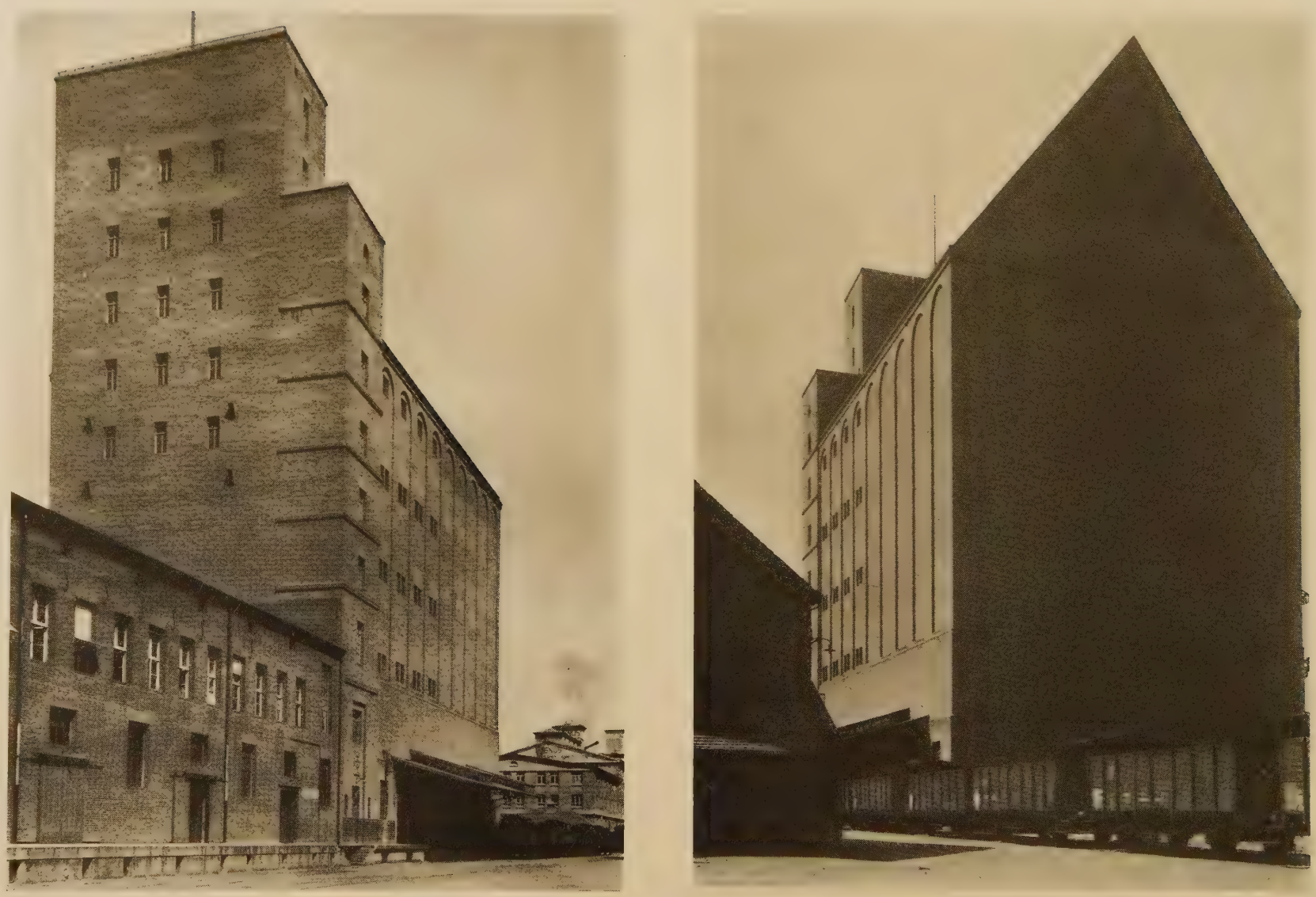
"Midnight Building," shop and offices, Stuttgart, Germany

Housing, Frankfort, Germany. (*Stucco on brick, whitewashed; iron and woodwork in blues and reds*)
Ernest May, Architect

Housing, Frankfort, Germany. Ernest May, Architect

Housing details, Frankfort, Germany. Ernest May, Architect

Grain Warehouse, Basel, Switzerland

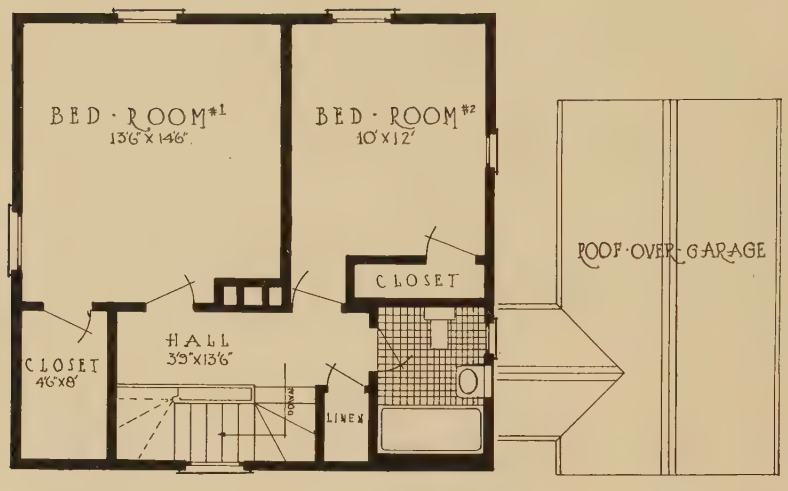


Grain Warehouse, Basel, Switzerland

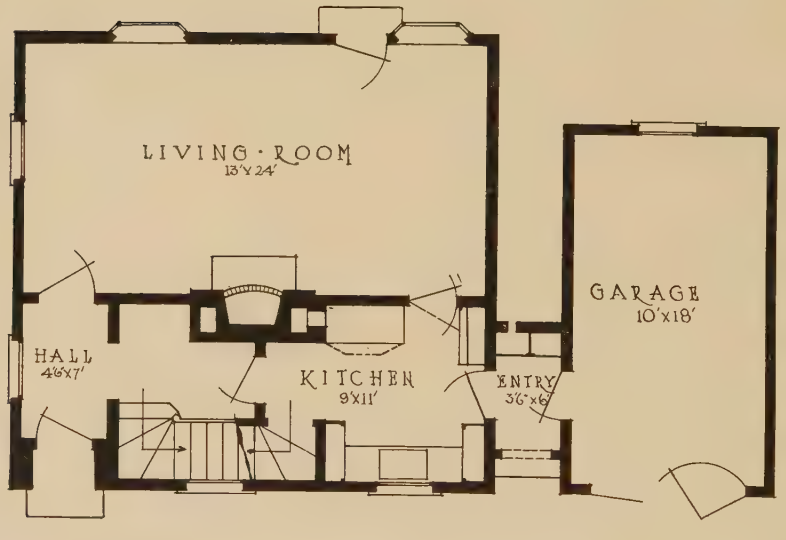
See plans on other side of sheet

House of Paul James Carey
Portland, Ore.

HAROLD W. DOTY, ARCHITECT



SECOND · FLOOR · PLAN



FIRST · FLOOR · PLAN

HOUSE OF PAUL JAMES CAREY, PORTLAND, ORE. HAROLD W. DOTY, ARCHITECT

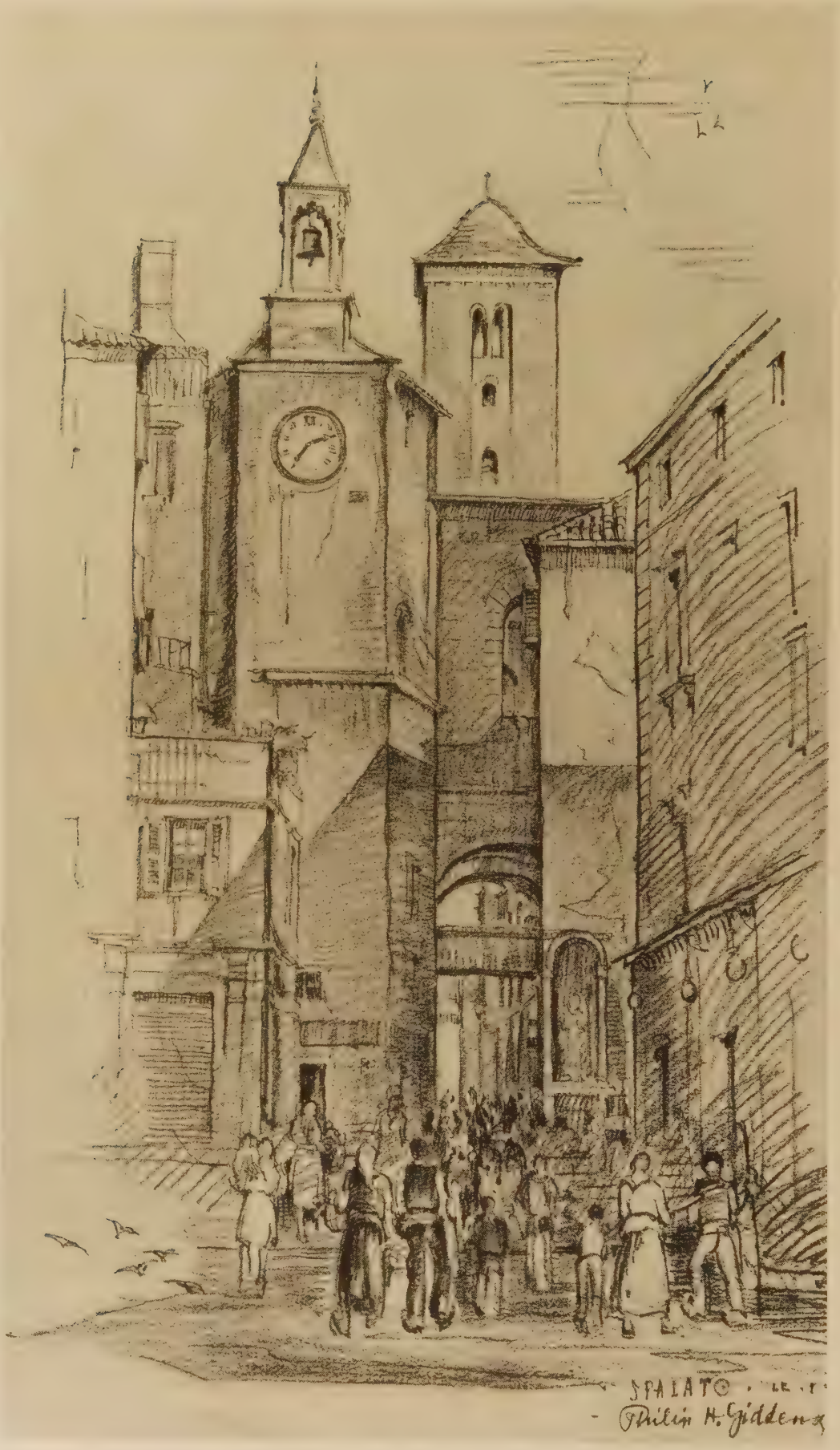
ENTRANCE TO THE TOWN, CATTARO
From the drawing by Philip H. Giddens

THE NARENTA BRIDGE, MOSTAR,
CAPITAL OF HERZEGOVINA, JUGO-SLAVIA

Drawing by Philip H. Giddens from which the etching shown on the next page was made

THE NARENTA BRIDGE, MOSTAR, CAPITAL OF HERZEGOVINA, JUGO-SLAVIA

From the etching by Philip H. Giddens



Piazza degli
Signori,
Spalato,
Dalmatia

Photographs by Sigurd Fischer

The room is of walnut with panels of rich burl; the furniture is of walnut and macassar ebony

LIBRARY IN THE APARTMENT OF C. J. LIEBMAN, NEW YORK CITY — BUCHMAN & KAHN, ARCHITECTS

The room is not only a library and workroom, but is designed to house a very fine collection of Persian and Chinese porcelains

LIBRARY IN THE APARTMENT OF C. J. LIEBMAN, NEW YORK CITY. BUCHMAN & KAHN, ARCHITECTS

Steel cabinets are built into the lower compartments, and the deep recess is backed with black marble; the general color scheme is of tans and plum colors; the lighting fixtures of white metal

LIBRARY IN THE APARTMENT OF C. J. LIEBMAN, NEW YORK CITY. BUCHMAN & KAHN, ARCHITECTS

BOOK REVIEWS

BUILDING CONSTRUCTION. By WHITNEY CLARK HUNTINGTON. 596 pages, 6 by 9 inches. Illustrated with photographs and diagrams. New York: 1929: John Wiley & Sons, Inc. $6.

The author, who is Professor of Civil Engineering, University of Illinois, has prepared this book primarily for use in a course in building construction given to second-year students in engineering, keeping in mind, however, the requirements of architectural draftsmen, inspectors and superintendents.

PATIO GARDENS. By HELEN MORGENTHAU FOX. 228 pages, 8 by 9¾ inches. Illustrated with pencil drawings, plans, and details. New York: 1929: The Macmillan Company. $6.

Mrs. Fox has brought back to us not only something of the elusive charm of Spanish gardens, but also much practical information as to how their architectural features—which, of course, are almost the whole thing in Spanish gardens—have been achieved.

RUSSLAND, EUROPA, AMERIKA. By ERICH MENDELSOHN. 220 pages, 9 by 13 inches. Illustrated with collotype plates. New York: 1929: Architectural Book Publishing Co. $6.

Another collection of Erich Mendelsohn's character portraits—the corporeality of these countries as seen through the eye of one who is interested in the unusual view-point, not only architecturally, but in economics and sociology.

INTERNATIONAL AIRPORTS. By STEDMAN S. HANKS. 195 pages, 5¾ by 8½ inches. Illustrated with photographs and line diagrams. New York: 1929: The Ronald Press Co. $5.

Colonel Hanks visited most of the European airports a year ago and has brought back for the use of American planners much practical information as to airport design and management.

DÆDALUS AND THESPIS. Volume I: ARCHITECTURE AND TOPOGRAPHY. By WALTER MILLER, Dean of the Graduate School, University of Missouri. 329 pages with 48 plates, 7¾ by 11 inches. New York: 1929: The Macmillan Company. $6.50.

Dean Miller has undertaken and successfully completed, in so far as the first volume goes, the tremendous task of culling from the contributions of the ancient dramatic poets any facts which would contribute to our knowledge of the arts and crafts of Greece. It is surprising to find that the classical drama abounds with allusions to contemporary architecture, topography, sculpture, painting, poetry, in addition to the more obvious matters of history and politics.

WROUGHT IRON AND ITS DECORATIVE USE. By MAXWELL AYRTON and ARNOLD SILCOCK. 196 pages, 9¾ by 12¼ inches. Illustrated from photographs and drawings. Printed in Great Britain. New York: 1929: Charles Scribner's Sons. $17.50.

The authors have made a real addition to architectural literature in this record of the English smiths, beginning in the fourteenth century. The working of iron was well established in England before the Romans came and has persisted, though with much variableness in understanding, unto this day. The illustrations are profuse and beautifully reproduced.

HANDBOOK OF BUILDING CONSTRUCTION. Two volumes. 1611 pages, 6 by 9 inches. Illustrated with diagrams, graphs, etc. New York: 1929: McGraw-Hill Book Company, Inc. $10.

A second edition of a work first published in 1920 by a staff of specialists, among whom are several architects of national reputation. A comprehensive reference work for formulæ, strength of materials, etc., including such unexpected subjects as acoustics and school planning, estimating, mechanical refrigeration, etc.

URFORMEN DER KUNST. Photographische Pflanzenbilder. By KARL BLOSSFELDT. 120 pages, 9¾ by 12¼ inches. Illustrated from photographs. Berlin: 1929: Ernst Wasmuth. $15.

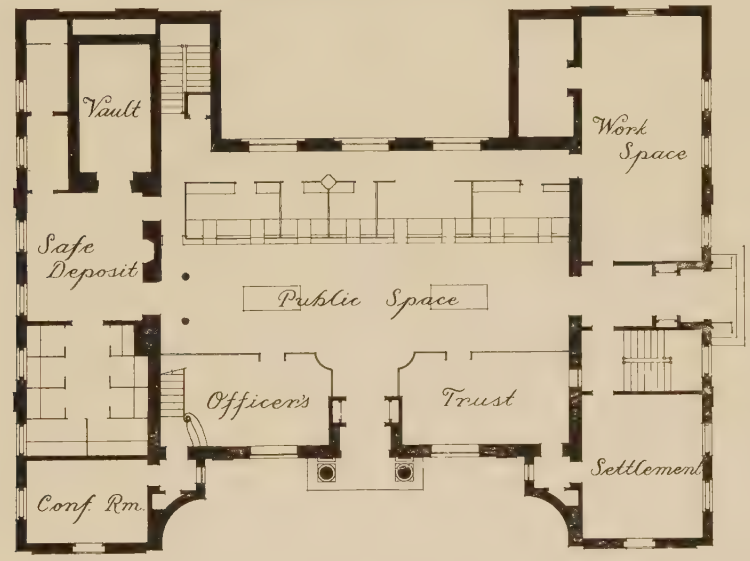
One of the most remarkable collections of inspirational photographs that has been published in many years. Plant life in a myriad of its decorative forms has been photographed, usually at great magnification. The book should take its place as a fertile source from which may be drawn inspiration for decorative detail.

LANDSCAPE DESIGN. By HENRY V. HUBBARD and THEODORA KIMBALL. 419 pages of text and 36 plates, 8 by 9¼ inches. Illustrated from drawings and photographs. New York: 1929: The Macmillan Company. $6.

A new edition of a work first published in 1917, a work prepared for use as a text book and also for the development of an æsthetic theory as the basis of landscape design.

THE COMPRESSIVE AND TRANSVERSE STRENGTH OF BRICK. By J. W. MCBURNEY. 15 pages, 5¾ by 9¼ inches. Illustrated with diagrams. Pamphlet binding. Bureau of Standards, Washington: 1929: U. S. Government Printing Office. 5 cents.

William M. Rittase



First Floor Plan
Scale

HOLMESBURG TRUST COMPANY, HOLMESBURG, PA.
DAVIS, DUNLAP & BARNEY, ARCHITECTS

Photographs by William M. Rittase

HOLMESBURG TRUST COMPANY, HOLMESBURG, PA. DAVIS, DUNLAP & BARNEY, ARCHITECTS

Harold D. Eberlein

HOLMESBURG TRUST COMPANY, HOLMESBURG, PA. DAVIS, DUNLAP & BARNEY, ARCHITECTS

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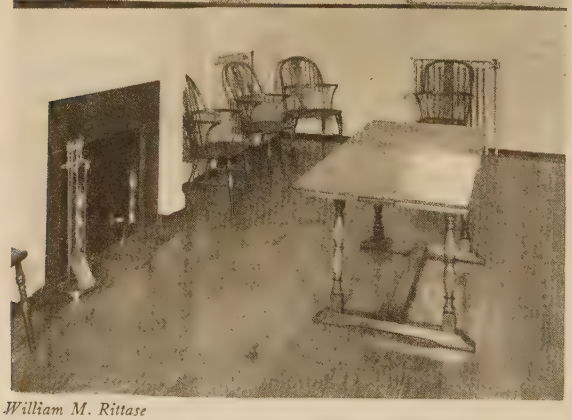


William M. Rittase

Harold D. Eberlein

HOLMESBURG TRUST COMPANY, HOLMESBURG, PA.

DAVIS, DUNLAP & BARNEY, ARCHITECTS

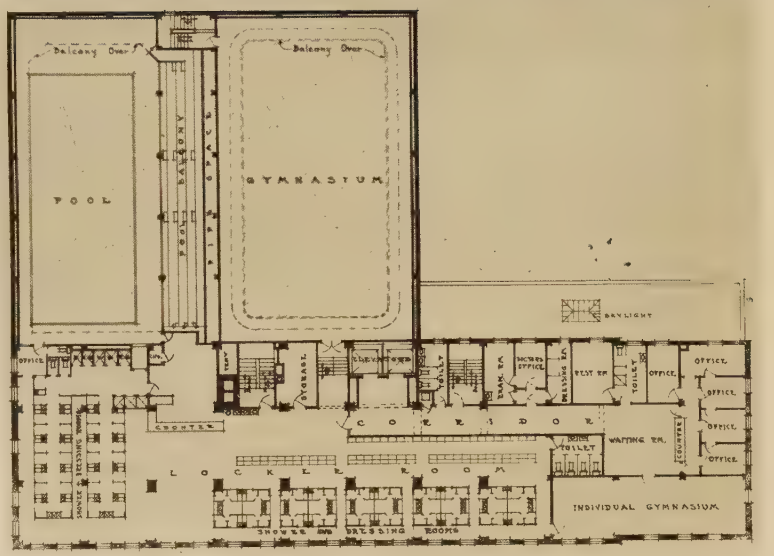
Y. W. C. A. Building, Minneapolis, Minn.

HEWITT & BROWN, ARCHITECTS

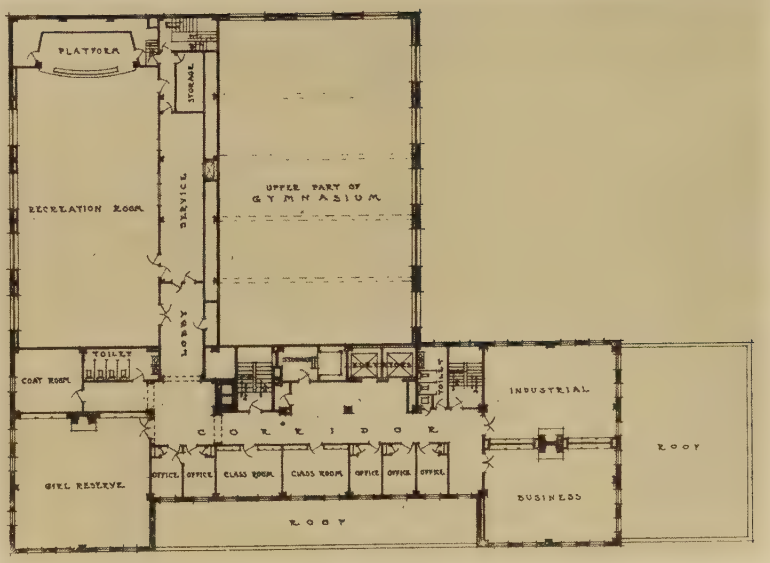
Fireplace end of the lounge

From the lobby toward lounge

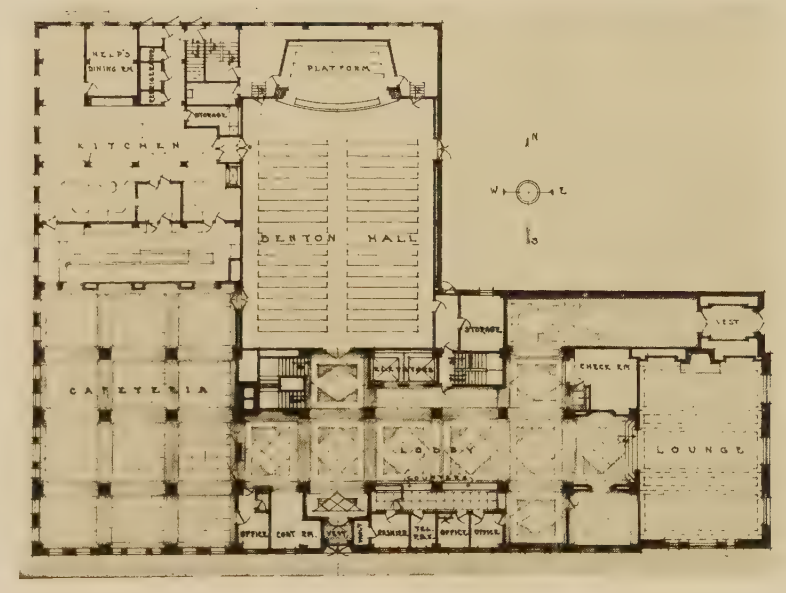
Y. W. C. A. BUILDING, MINNEAPOLIS, MINN. HEWITT & BROWN, ARCHITECTS



Third-floor plan



Fifth-floor plan



Main-floor plan

Y. W. C. A. BUILDING,
MINNEAPOLIS, MINN.

HEWITT & BROWN,
ARCHITECTS

The main lobby

Roof terrace from solarium

Twelfth Street entrance

Y. W. C. A. BUILDING,
MINNEAPOLIS, MINN.

Solarium, eighth floor

Grille in lobby

Nicollet Avenue entrance

HEWITT & BROWN,
ARCHITECTS

The auditorium, Benton Hall

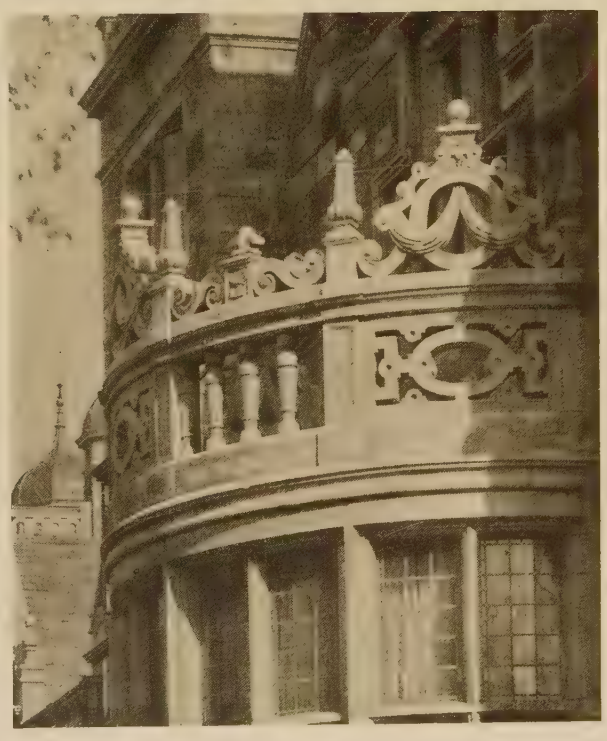
Detail of railing, lobby grille

Y. W. C. A. BUILDING, MINNEAPOLIS, MINN. HEWITT & BROWN, ARCHITECTS

ARCHITECTURE'S PORTFOLIO OF BALUSTRADES

ROGER H. BULLARD

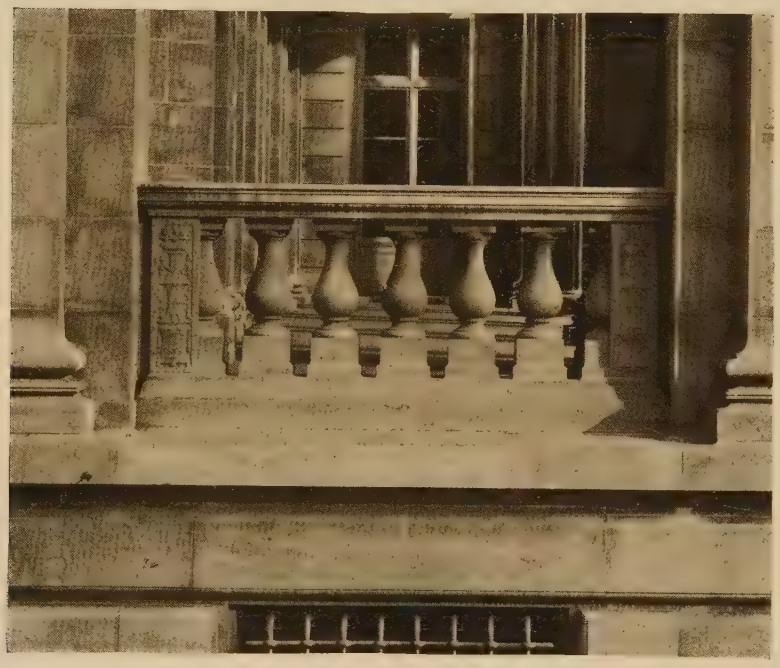
WILLIAM MITCHELL KENDALL



YORK & SAWYER

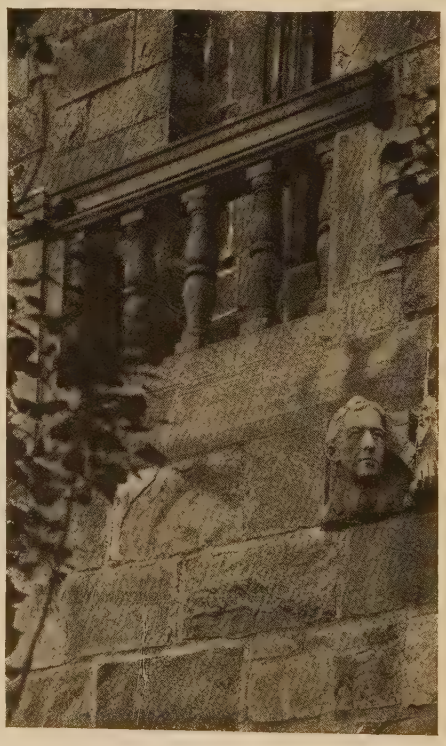
MONT DES ARTS, BRUSSELS

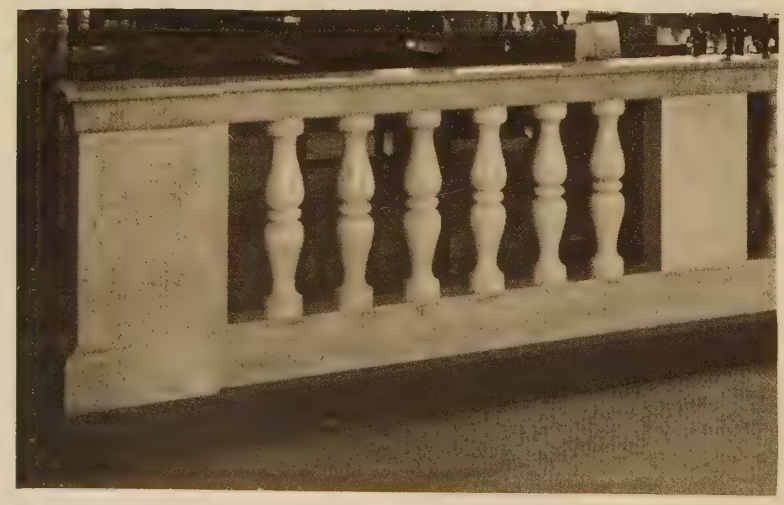
FRANK GOODWILLIE
WESLEY S. BESSELL



THOMAS HASTINGS

JAMES GAMBLE ROGERS





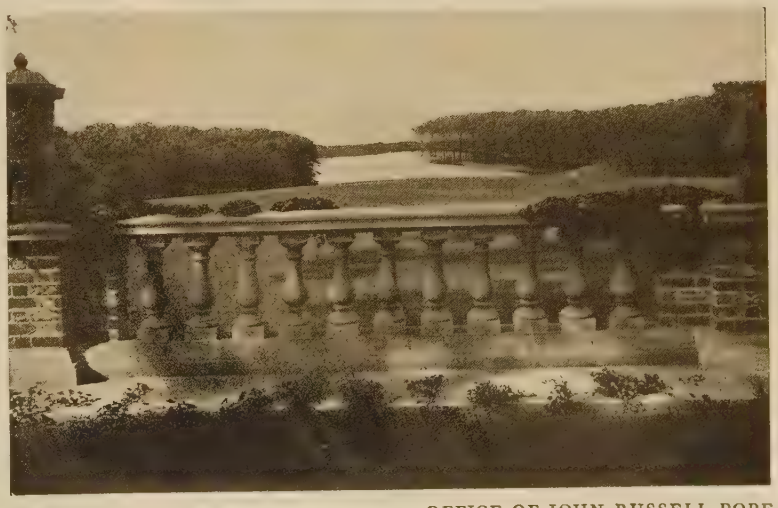
WARREN & WETMORE

GEORGE WASHINGTON SMITH

EDW. L. TILTON AND ALFRED MORTON GITHENS

CHIPPING CAMPDEN,
GLOUCESTERSHIRE

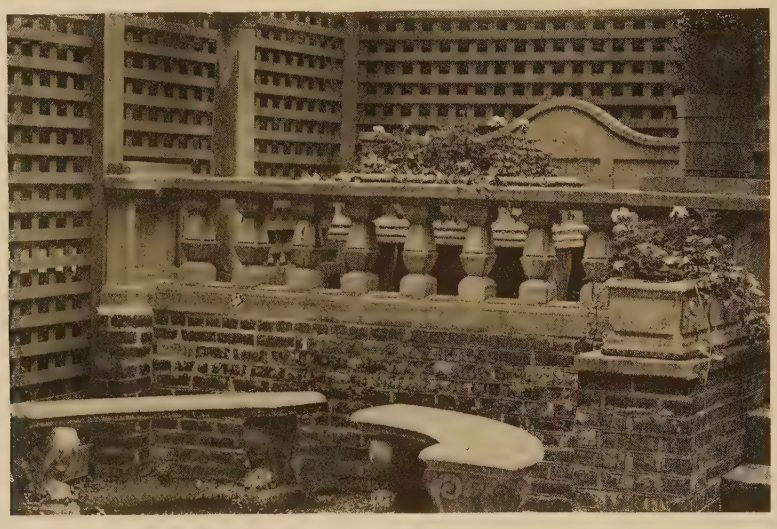
McKIM, MEAD & WHITE



OFFICE OF JOHN RUSSELL POPE

PAUL P. CRET

DENNISON & HIRONS



CHARLES A. PLATT

WARREN & WETMORE

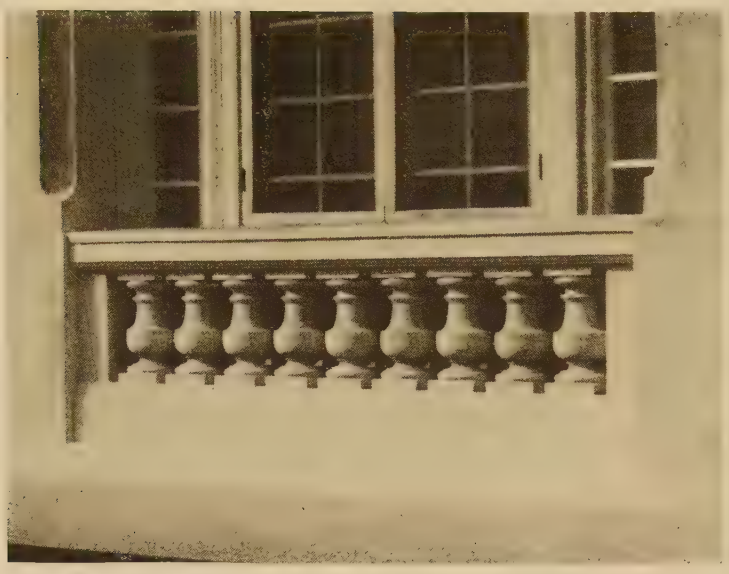
ALBERT KAHN

I. N. PHELPS STOKES

SCHENCK & WILLIAMS

M. L. & H. G. EMERY

CROSS & CROSS



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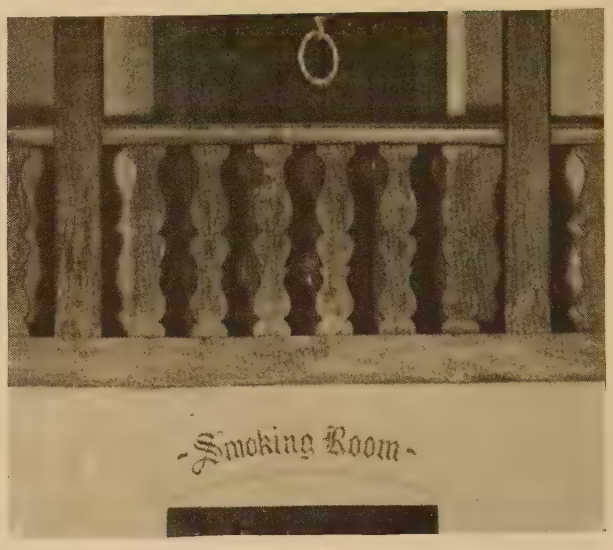

JOHN H. PHILLIPS

DESIGNED BY

ARTHUR TODHUNTER

BERTRAM G. GOODHUE

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The Editor's Diary

Saturday, September 21.—Lingered with William F. Lockhart, David C. Coyle, and Arthur T. North over the luncheon table at the League, talking of the economic and engineering limits to high buildings, and the tendency in recent days to shave factors of safety to the minimum in the effort to save money. Coyle, the engineer, thought we had not gone to dangerous extremes in that particular but ventured the hope that the factor of safety against ignorance or errors in figuring would not be omitted.

Monday, September 23.—With Rutherford Boyd, Scott Williams, and Coyle, discussing the perennially interesting question of how much was known by the Egyptians regarding geometry and higher mathematics. Coyle adduced testimony to the effect that they must have known the earth to be round, having the ability to foretell eclipses of the sun.

Tuesday, September 24.—Editors of the professional journals met Ely Kahn, Ralph Walker, and Raymond Hood to hear the preliminary plans for the forthcoming series of one-man shows at the League this winter, something of which scheme has been set down in these columns. The series is to start with an exhibition of the architectural work of Holabird & Root in November. Here surely is a splendid antidote for the succession of modernistic exhibitions that have stirred the public for the past few years—not another attempt to show how bizarre in color and form our contemporary forms of art expression may become, but a visual record of what is actually being done in the building of America to-day, backed by the confidence of hard-headed men of business. Details of succeeding exhibitions are not yet completed, but if the work of such men as Lee Lawrie, Eliel Saarinen, Ragnar Östberg, and their like can be shown to the League, the New York public, and, through other co-operating organizations, to other cities as well, the results cannot but be of enormous benefit in cultivating a wider and more intelligent public appreciation. I hope that no false modesty will prevent the three men first mentioned above, who are launching the scheme, from including their own notable achievements in the series.

Thursday, September 26.—Milton Lowenstein, holder of a Guggenheim fellowship in architecture, has just returned from a four months' visit to Scandinavian countries. His accounts of meeting Östberg, Ivar Justus Tengbom, and other architects who are doing important work over there are most refreshing. Less and less, however, he is convinced, is the architecture of the Scandinavian countries coming to be dependent upon individual genius, and more and more upon the thought and will of the peoples themselves, which is a healthful sign of the times.

Monday, September 30.—Spent an hour with Ely Kahn picking out illustrations from his voluminous library to serve as illustrations for his article on "Sources of Inspiration." His library abounds in books which have apparently only the most remote connection with architecture, but which upon examination reveal unexpected wealths of subject-matter.

Tuesday, October 1.—Reginald Johnson in from the Pacific Coast upon one of his frequent visits. I have an idea that eastern fox-hunting draws him as strongly as the new things in architecture.

Wednesday, October 2.—The editors of the various architectural journals met to-day at luncheon, after which followed a free-for-all criticism of some of our latest architectural monuments, so called. It is a pity that architectural criticism cannot find its way more freely into the pages of the magazines.

Thursday, October 3.—The Architectural League at the luncheon hour is coming to be a crossroads of the world. To-day, for example, among the ninety or a hundred architects and draftsmen present, those at our table were: Dr. Warren P. Laird, head of the architectural school, University of Pennsylvania, just back from two months abroad; Alexander B. Trowbridge, up for a few days from Washington; Richard B. Marr, on from Detroit; Julian Clarence Levi, just back from Palestine, where he has been doing some architectural work, making the preliminary drawings in Paris.

Friday, October 4.—Harold Butterfield back from Belgium, where he has been remodelling a house for himself in Brussels. In order to obtain a building permit there the architect has to furnish the proper officials with two copies of the working drawings in black ink, one copy on white opaque paper, the other on linen. We have no corner on red tape over here, evidently. He reports feverish building activity in Belgium, whole blocks of old buildings being torn down and replaced. Paris, on the other hand, is very quiet, with a few new shops and some apartment building on the outskirts.

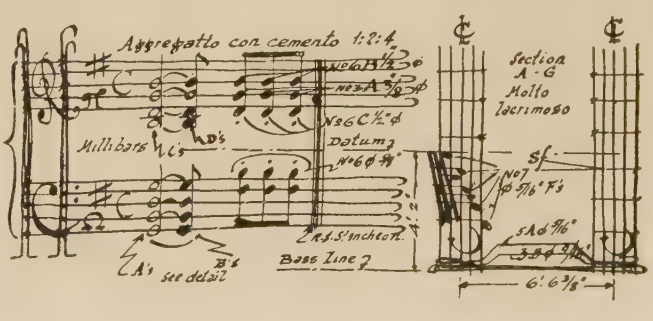
Saturday, October 5.—Lunched with Arthur T. North and Scott Williams, the painter, who entertained us with thrilling stories of how he had been striving to catch the mood of an approaching storm on the coast of Maine in watercolor. The necessity of putting just the right single wash for a breaking wave when time and weather are both passing and when there is no possibility of correcting it afterward if wrong, has in it all the thrills of big-game hunting.

Tuesday, October 8.—Walked up Fifth Avenue to 53d Street with Ely Kahn to see a new jewelry store for Van Cleef & Arpel, Inc.—an example of utter restraint in the design of a sumptuous showroom and its dependencies. Walnut, curly maple, and marble are used for the trim, display cases, and walls, with peach velvet backgrounds for the displays, and lighting fixtures in quartz and silver.

Wednesday, October 9.—Gerald Geerlings, back on the *France* after a year's absence abroad studying etching, full of amusing anecdotes; of how we are misunderstood by other peoples, particularly the English; of bicycling through England, Holland, and France.

Thursday, October 10.—Ralph Walker conducted a discussion at the League to-night on the subject, "Architecture and the Machine," trying to limit the talk to the question of whether architecture of to-day is a machine. As compared with the building for eternity in former times, we now put up buildings, knowing that they will have a life of ten years, possibly more, possibly less. We do the same with automobiles. Is this new view-point of our buildings bringing a new attitude on the part of the designer? Among those who kept

A correspondent of "The Architects' Journal," London, after having spent some hours in the design of reinforced concrete, went to a classical concert. The dream which followed is set down herewith.



the ball in the air were Bassett Jones, the elevator engineer, Roderick Seidenberg, just back from Russia, Francis Keally, Eugene Schoen, Ely Kahn, Henry W. Kent of the Metropolitan Museum, Raymond Hood, Leon Solon, and David C. Coyle. There were enough by-paths opened up in the course of the evening's talk to suggest a whole year's editorial programme.

Friday, October 11.—David Coyle, an engineer, has a lot more feeling for architectural design in his nature than many of those who scorn his profession. He offered a plea last night in the discussion that the architect should pay more attention to the flow lines of his tall buildings—in other words, not to set boxes one on top of the other in a tall pile which, with its growing height, grows farther and farther out of apparent equilibrium. There is no necessity for it, nor any possibility of showing the steel skeleton of a tall building, but the lines of force through which its weight is transmitted to the earth should at least impress the observers with some assurance as to their logic and, if possible, grace.

Monday, October 14.—Bassett Jones brings out the interesting point that some of our more recent skyscrapers in New York City would be freed of a tremendous handicap if they were built on stilts, omitting a block of floors between the street level and the tops of adjacent buildings. In other words, the demand is for the upper floors in high buildings; the lower floors do not carry their share of the financial burden. This sounds like a good argument for the height restrictionists.

Wednesday, October 16.—It is becoming the fashion apparently to recognize the completion of buildings in New York City by inaugural luncheons such as I attended to-day in the new Stewart Building—the last word in modernism on Fifth Avenue. Harvey Corbett presided, and many architects had come, among others interested in civic betterment, to see the new job. Sat at table between Dwight James Baum and Lafayette Goldstone, with Electus Litchfield, Alexander Trowbridge, Parker Hooper, and Kenneth Murchison near by. Warren & Wetmore designed it, and any architectural organization which can turn out the New York Central Building and this new Stewart Building shows versatility.

Thursday, October 17.—Went up to 103d Street and Riverside Drive to attend the dedication of Harvey Corbett's Roerich Museum—an unusual combination of exhibition rooms below with apartments above. Found, among several hundred others, Charles Livingston Bull inspecting with great enthusiasm the thousand or more paintings by Nicholas Roerich. Far too many good things here for proper appreciation. If, instead of a hundred drawings, there was but one in a room, one could really enjoy it. On account of the vast crowd present many of us were unable to hear Harvey Corbett preside at the dedication ceremonies.

Friday, October 18.—Read a particularly interesting article in *The Architects' Journal*, London, describing the rebuilding of Rheims in its present stage of progress. Two hundred fifty tons of the ancient lead used at the time of rebuilding the roof after the fire of 1481 were collected, remelted, and used again, under the sympathetic direction of Henri Deneux.

Saturday, October 19.—Gerald and Betty Geerlings out for the week-end bringing his first crop of etchings. With two having been accepted for the Royal Academy Exhibition out of the three submitted, and with both of these selling at once, and with the Victoria and Albert Museum buying another, Geerlings's career as an etcher seems to be well launched.

Tuesday, October 22.—When may a building be said to have achieved a patina and when is it merely dirty? Take for example the New York Public Library as shown by the two accompanying photographs. McKim, Mead & White's Pennsylvania Station is being washed down with a cleaning fluid.

Wednesday, October 23.—Thomas Hastings is dead—a stalwart figure whose passing seems in a way to bring to an end a definite period in American architecture. It seems doubtful if ever again we shall lean so heavily upon and interpret so readily the classic tradition.

Thursday, October 24.—William Jones Smith, in from Chicago to "inspect models"—at least that is the purpose with which his office labels his visit. His luncheon hour at The League so frequently interrupted by welcoming handshakes from old friends that Peter de Gelleke, Gerald Geerlings, and I, sitting with him at table and discussing the differences between contract procedure in Chicago and New York, felt as if we had strayed into the wrong Old Home Week.

Friday, October 25.—Joined Smith on an inspection tour about town, looking over Ely Kahn's new high-hat jewelry store and Warren & Wetmore's Stewart Building. Then up to call on Lee Lawrie and marvelled at the models he is making for the Harrisburg Bridge, the West Door of the Cathedral of St. John the Divine, a fountain for the Children's Garden of the Los Angeles Library. Lawrie has a theory which seemed to us pretty nearly a complete answer to the question: "What is happening to art to-day?" It is that we must move steadily forward, but without too great jumps. The results of these great jumps are rarely accepted by the slower moving mass of public opinion. Mankind will more readily accept a work of art which, while fresh and progressive, does not break entirely with that which has already been accepted as good. The whim of the moment—a fashion trend—may indicate otherwise, but the fact remains that all great art which has endured has been the result of slow progress rather than the sudden flash of something new.

We joined James Monroe Hewlett at lunch to talk of the allied arts movement and, incidentally, Smith's pet hobby of adult education—something beyond the neat little package given us by the schools. Verily, we need it.

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The front of the New York Public Library as it was fifteen years ago and as it is to-day. What it will be remains for Thomas Hastings's will to provide

CONTACTS

DEVOTED TO A BETTER UNDERSTANDING OF THE BUSINESS SIDE
OF ARCHITECTURE AND ITS RELATION TO THE INDUSTRIES

What Glass Is Best for My Factory?

By H. S. Jacoby

Chief Engineer, The H. K. Ferguson Co.

THREE-FOURTHS of the sidewall area of the modern industrial building is of glass. The roof, too, often carries large expanses of sash. Dingy, depressing plants that used to be the rule have had to give way to structures flooded with the cheerful light of day. Daylight no longer has to be sold. The manufacturer who plans to build demands it. What he wants to know is how to get enough light of the right sort into every part of his plant.

In recent years there has been considerable research into the problem of daylight illumination. These studies have served to establish the fact that, generally speaking, a minimum intensity of 10.0 foot candles provides sufficient light for most manufacturing operations. It is the business of the engineer who designs industrial buildings to provide sufficient window area, and so distribute it that the intensity of daylight illumination will not fall below an established minimum at any point.

Our own studies have convinced us that the type of glass used has an important bearing on the distribution of light. Fatigue from eye-strain also can be allayed. The cost of building maintenance can be materially reduced.

Not many years ago, before figured surfaces were available, clear glass was the only kind used in factory windows. It still is specified in many plants to meet certain requirements. The National Cash Register Company, Dayton, Ohio, has clear glass in practically every one of its buildings. The late John H. Patterson, the company's founder, wanted his employees to be able to look out and see the beautifully landscaped grounds and the surrounding hills. The Selby Shoe Company, Portsmouth, Ohio, also has clear glass throughout its plants.

Both these concerns use shades to shield from the direct rays of the sun those working close to the windows. Sufficient glass area has been provided so that even when a portion is shaded the illumination does not fall below a satisfactory minimum.

National Cash Register Co.'s factory, Dayton, Ohio

Quite contrary to the attitude of these concerns, many hold the opinion that workmen produce more if they are prevented from looking out of doors. Still others have secret processes that must be hidden from the gaze of curious outsiders.

In response to these requirements, the glass industry in recent years has developed several obscure or figured surfaces that have come into wide use. Figured surfaces are available in a number of different designs. All serve effectively to screen the vision.

Experience has shown that some types of glass diffuse the direct rays of the sun in such a manner that the intensity of light is reduced at points near the windows, and increases at more distant points. It helps to "level" the light and to reduce shadows.

Factory ribbed is the best known type of obscuring glass. It was almost universally used during the World War and in the years immediately following. Its surface consists of many small parallel ribs of prismatic form. Ribbed glass usually is installed with the ribs vertical. In this position it neutralizes the shadows cast by columns and other vertical obstructions. If the ribs are horizontal it will help to transmit the light back into the centre of the building. When the sun shines upon it, the glass itself is intensely luminous. Workmen who are obliged to face it complain of serious eye-strain.

A somewhat similar type of glass is figured with a heavy V-shaped scoring, that forms parallel ribs of distinct prismatic form. This glass functions like ribbed glass, but because the figure is larger, the individual prism surfaces stand out in alternate contrasting bands of light and dark. When installed in skylights this glass diffuses the sunlight evenly over the floor area. If placed with the rolled surface down, the V-shaped scores prevent condensation drip by conducting moisture to the gutters. Located thus, well above the horizontal line of vision, the objection from the standpoint of eye-strain is removed, and the illumination is noticeable.

Another type of glass that has come into wide use has a surface formed by two sets of shallow parallel scores at right angles to each other. The resulting figure consists of many small, regularly spaced projections of somewhat pyramidal form. This glass diffuses the light both in the vertical and horizontal planes.

Hammered glass, so called, with other similar forms, is a rough glass

with figures that resemble hammer-marks. It is comparatively smooth and hence is easy to clean. It diffuses the light sufficiently for most requirements and does not have the intensely luminous appearance that is characteristic of many figured surfaces. It is especially desirable for use in sidewall sash because workmen who face it are not subjected to serious glare.

Glass in various shades of amber has been advanced by the glass industry as a means of alleviating heat during the summer months, and reducing the glare from direct sunlight. It filters the heat rays from the sunlight, lessening the discomfort which workmen may suffer who are exposed to the radiant heat that is transmitted by large areas of ordinary glass. It is important to note that while amber-colored glass causes a marked reduction in total illumination, the acuity of vision may even be increased due to the fact that the normal human eye focuses amber light to better advantage than the other portions of the spectrum.

During a recent trip to Germany, the writer had an opportunity to examine several large dirigible hangars. It was interesting to note that many of them were glazed with amber glass to prevent expansion of hydrogen gas with which the ships are filled.

Some manufacturers are obliged to resort to double glazing in order to eliminate condensation drip. This is especially true in plants where artificial humidity must be maintained. Our engineers recently completed a large installation of this sort in a southern textile mill, where a very slight variation in temperature, or a small amount of drip from the sawtooth skylights, would ruin the material in process. The use of double glazing and cork roof insulation assures satisfactory results in this case.

Shades, for office windows, when properly designed and used, provide an effective means of control. Professor H. H. Higbie, in a series of investigations, has established the fact that Venetian blinds that can be drawn up from the bottom of the window, having slats adjusted at the proper angle, will not only eliminate the glare of the glass in a horizontal line of vision but reflect the light upwards to the ceiling. From here it is diffused and reflected back to the working level. Professor Higbie's tests show that the minimum illumination at the centre of a building is better with the lower panes covered in this manner than it is with all glass bare.

Too much dependence should not be placed on sidewall windows for lighting wide buildings. The glare from a large area of glass causes eye-strain and fatigue. Additional light through sawtooth or monitor windows must supplement sidewall illumination, so that the ratio between maximum illumination at the side of the building and minimum illumination at the interior shall not exceed three to one.

Most complaints by workmen about conditions in daylight buildings arise from the extremely luminous appearance of the figured glass in sidewall windows. Our experience has shown us that it is good practice to glaze only the upper lights of sidewall sash with figured glass and use clear glass in the two lower tiers. Hammered glass is a good compromise in cases where conditions require the use of an obscuring surface. This method keeps the bright glass above the ordinary line of vision and diffuses the light from the upper panes in a satisfactory manner. Even direct sunlight through the lower panes cannot shine far enough into the building to cause discomfort.

Not much weight need be given to the relative amount of light transmitted by various kinds of colorless glass. After exposure to dirty atmosphere for a few days they are all on much the same plane. Our examinations of test windows have shown no noticeable difference in the amount of accumulation on the various samples of glass in a given period.

Mr. Jacoby's article will be concluded in the next issue, dealing with the cleaning of glass and how this affects the choice of pattern

ADVERTISING THE PROFESSION

The adjoining advertisements show, greatly reduced, the first two of a series of pages addressed to the public, appearing in "Scribner's Magazine" and elsewhere. It is our thought that we as "interested bystanders" may be able with propriety to give the public a better idea of the architect and his functions.